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BULLETIN NO. 42

BUREAU OF EDUCATIONAL RESEARCH
COLLEGE OF EDUCATION

TEN YEARS OF EDUCATIONAL RESEARCH, 191[illegible]-1927

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1927-28 AND 1928-29

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FOREWORD

A survey of the development of educational research readily yields the conclusion that the pioneer stage has passed, that "quantity production" has been achieved. The passing of the pioneer stage appears to have begun before the close of the second decade of the present century. It has not seemed inappropriate, therefore, to choose 1918 as the beginning of the period for which educational research activities are described in this bulletin. However, the immediate motive for choosing this date is that the Bureau of Educational Research at the University of Illinois was established by action of the Board of Trustees on June 1, 1918, and work was begun on the eighth day of the following month.

Furthermore, a number of events centering about 1918 indicate that a new period of educational research began about that time. The psychological testing of army recruits was begun during 1917 and became fully established the following year. This event is especially significant because it was the first extensive measurement of intelligence by means of group tests. It also tended to create a popular interest in the measurement of intelligence. A number of the examiners were from the faculties of teacher-training institutions, and their army experience made most of them enthusiastic advocates of the use of intelligence tests in our schools. The Iowa Child Welfare Research Station was authorized by the Iowa General Assembly in 1917. The Commonwealth Fund from which numerous subventions for educational research have been made was established in 1918. The American Council on Education was organized during the same year. Several books published about this time stimulated interest in educational research and facilitated the offering of courses in this field by teacher-training institutions. The following seem to have been especially influential: Rugg—*Statistical Methods Applied to Education,* 1917; Monroe, DeVoss, and Kelly—*Educational Tests and Measurements,* 1917; Bobbitt—*The Curriculum,* 1918; Monroe—*Measuring the Results of Teaching,* 1919; Alexander—*School Statistics and Publicity,* 1919; Terman—*The Intelligence of School Children,* 1919. Finally, Part II of the *Seventeenth Yearbook of the National Society for the Study of Education,* published in 1918, was prepared by a committee of the National Association of Directors of Educational Research.[1]

The action of the Board of Trustees establishing the Bureau of Educational Research at the University of Illinois provided for a

[1]This yearbook contains Thorndike's famous statement: "Whatever exists at all exists in some amount." (p. 16.)

Director and a budget of $9,000 in addition to his salary. B. R. Buckingham took up his duties as the first Director of the Bureau on July 8, 1918. The position of Assistant Director, created January 15, 1919, was temporarily filled by Charles E. Holley. The present Director served as Assistant Director from September 1, 1919, to September 1, 1921, when, upon resignation of the first Director, he was promoted to that position. During the year 1918-19, a Library Division was developed for the purposes of (1) "cataloging" publications received, (2) rendering bibliographical service in response to inquiries, and (3) developing a school textbook library. The budget for 1920-21 provided for two Assistants, two Library Assistants, and five Stenographers, in addition to a Director and Assistant Director. The appropriation for Expense and Equipment was $6,400. The corresponding appropriation for 1927-28 was $7,600.

The recommendation providing for the establishment of the Bureau of Educational Research described its activities as follows: "investigating the problems of teaching and school administration, collecting information concerning the best educational practices of this and other countries, and placing the results obtained before the schools of the state." This statement is general, and those in charge of the Bureau have faced the problem of determining the details of its activities. In 1918, the activities of similar organizations at other institutions centered largely about the distribution of educational tests, the tabulation of scores reported by users of the tests, and the dissemination of information about tests. It was therefore natural that the Bureau at Illinois should engage in these activities. A beginning was made during the first year, but the labors incident to organizing a new department, together with other handicaps operating during the scholastic year of 1918-19, tended to restrict the development of this phase of the work. The activities relating to educational tests developed rapidly during the year of 1919-20, and soon after the opening of school in September, 1920, it became apparent that the publication and distribution of educational tests had become a commercial enterprise and were interfering with research activities. Accordingly, this phase of the Bureau activities was discontinued in December, 1920.

During the year of 1918-19, several projects were initiated, of which the planning for the *Journal of Educational Research* was doubtless the most significant. Although this journal was published by the Public School Publishing Company of Bloomington, Illinois, the editorial activities were carried on as a bureau project until September, 1921. The Announcement of the Bureau of Educational Research

issued September 30, 1918, included the proposal of four topics for study:

1. Promotions and non-promotions
2. The relation of instruction in reading to the development of reading ability
3. The construction of a scale and of standards for concrete arithmetical problems
4. Modifications of the course of study due to the war[2]

According to the First Annual Report, published October 27, 1919, studies relating to the first three of these topics were undertaken. The activities of 1918-19 also included the initiation of several test-construction projects and of studies relating to the following topics:

1. Memory work in the grades
2. Evaluation of intelligence tests
3. Type lessons
4. Titles of graduate theses in education

Two studies of promotion and an investigation of the rate of silent reading were reported briefly in the First Annual Report.[3] The studies of "memory work in the grades" and of "intelligence tests" were reported as the third and fourth bulletins of the Bureau of Educational Research.[4] The titles of graduate theses in education for the period January, 1917, to June, 1919, were published in mimeographed form.

The First Annual Report listed fourteen "proposed projects" for 1919-20:

Project	I.	Standardization of educational tests
Project	II.	Collection of information about the usefulness of tests
Project	III.	Derivation of new test material
Project	IV.	Degree of equivalence of the different forms of Monroe's Silent Reading Test
Project	V.	Analysis of arithmetical abilities and study of pupils' errors
Project	VI.	Determination of validity and reliability of educational tests
Project	VII.	Efficiency of the departmental teaching of mathematics
Project	VIII.	The amount of time spent on topics in arithmetic
Project	IX.	The supply of trained teachers and the demand for them
Project	X.	Supplementary study of memory work
Project	XI.	The selection of textbooks

[2]Buckingham, B. R. "Bureau of Educational Research Announcement, 1918-19," *University of Illinois Bulletin,* Vol. 16, No. 5, Bureau of Educational Research Bulletin No. 1. Urbana: University of Illinois, 1918, p. 22.

[3]"First Annual Report, Bureau of Educational Research, College of Education, Announcement, 1919-20," *University of Illinois Bulletin,* Vol. 17, No. 9, Bureau of Educational Research Bulletin No. 2. Urbana: University of Illinois, 1919, p. 13-20.

[4]Bamesberger, V. C. "Standard Requirements for Memorizing Literary Material," *University of Illinois Bulletin,* Vol. 17, No. 26, Bureau of Educational Research Bulletin, No. 3. Urbana: University of Illinois, 1920. 93 p.

Holley, C. E. "Mental Tests for School Use," *University of Illinois Bulletin,* Vol. 17, No. 28, Bureau of Educational Research Bulletin, No. 4. Urbana: University of Illinois, 1920. 91 p.

Project XII. The extension of Monroe's Silent Reading Test III for use with college students
Project XIII. Superintendents' conference
Project XIV. The Journal of Educational Research

Projects I and IV eventuated in the publication of Bulletin No. 5,[5] and Project VI, in Bulletin No. 8.[6] Late in the scholastic year of 1919-20, the derivation of the Illinois Examination was undertaken. This work was reported as Bulletin No. 6.[7] The results of Project X were published as Bulletin No. 3.[8] Project XII was carried on by C. W. Stone, acting professor of educational psychology during the first semester of 1919-20.

Resignation of the first Director in the summer of 1921 was accompanied by the removal of both the *Journal of Educational Research* and his personal collection of educational periodicals and other printed materials, which had constituted a large portion of the library of the Bureau of Educational Research. These changes, together with the discontinuance of the publication and distribution of educational tests in December, 1920, and the resignation of certain other members of the staff, led to a redefinition of purposes. The Library Division was abolished, and the plan of cataloging which was proving impractical was discarded. During the year 1921-22, a new plan of cataloging was worked out, and the remnants of our collection of publications were recataloged. This new plan is still being followed in handling the publications received by the Bureau. This work constitutes one of the major activities, and the bibliographical file has proved to be a valuable research instrument. The collecting of the titles of graduate theses in education has been continued and classified lists have been published for the following periods:

First Compilation—January, 1917-June, 1919
Second Compilation—January 1, 1919-August 31, 1920
Third Compilation—September 1, 1920-January 1, 1922
Fourth Compilation—January 1, 1922-November 1, 1923
Fifth Compilation—November 1, 1923-October 15, 1925
Sixth Compilation—October 15, 1925-October 15, 1927

Throughout its existence, the Bureau has always stood ready to render direct services to the public schools of the state. Although it has been possible to do much of this work by correspondence, mem-

[5]Monroe, W. S. "Report of Division of Educational Tests for '19-20," *University of Illinois Bulletin*, Vol. 18, No. 21, Bureau of Educational Research Bulletin, No. 5. Urbana: University of Illinois, 1921. 64 p.

[6]Monroe, W. S. "A Critical Study of Certain Silent Reading Tests," *University of Illinois Bulletin*, Vol. 19, No. 22, Bureau of Educational Research Bulletin, No. 8. Urbana: University of Illinois, 1922. 52 p.

[7]Monroe, W. S. "The Illinois Examination," *University of Illinois Bulletin*, Vol. 19, No. 9, Bureau of Educational Research Bulletin, No. 6. Urbana: University of Illinois, 1921. 70 p.

[8]Bamesberger, V. C. "Standard Requirements for Memorizing Literary Material," *University of Illinois Bulletin*, Vol. 17, No. 26, Bureau of Educational Research Bulletin, No. 3. Urbana: University of Illinois, 1920. 93 p.

bers of the staff have made trips from time to time to confer with boards of education, superintendents, and others; to speak at teachers' meetings; and to conduct investigations, such as school surveys. Among such investigations, the most extensive was a testing program, carried out during 1920-21 in response to requests by the county superintendents of the state, which resulted in the construction and standardization of the Illinois Examination.

Practically all of the major activities of the Bureau of Educational Research since the beginning of the present administration in September, 1921, have culminated in printed publications, of which a complete list appears as Appendix B, page 139. Members of the staff of the Bureau have contributed also a considerable number of articles to educational periodicals and other publications. Some of these embody the results of minor activities carried on by the Bureau; others have no direct connection with the work of the Bureau. An examination of Appendix B will reveal three types of publications: (1) studies contributing to an evaluation, organization and summarization of educational writings, particularly reports of research,[9] (2) writings of a more or less textbook nature intended to inform or instruct,[10] and (3) reports of original research.[11] However, it must not be thought that these lines of distinction have been held to rigidly. In most publications there is some evaluation and summarization of other writings, and publications of the first type often assume something of an authoritative, textbook character. The following description will give a somewhat clearer idea of these three types.

"A Bibliography of Bibliographies" (Bulletin No. 36) and "Principles Relating to the Engendering of Specific Habits" (Circular No. 36) are illustrative of the first type of publication. In the former, Monroe and Asher brought together 231 bibliographies. The following information was given for each: period covered, types of sources, degree of completeness, annotations, and scope. An analytical index was also provided. In Circular No. 36, Reagan presented twenty-five principles which he "derived from general psychological principles, educational theory, and the reports of certain investigations." A bibliography of the more important books relating to the subject was included.

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[9] *See* Bulletins 16, 26, 29, 36, and Circulars 14, 17, 20, 22, 23, 24, 25, 27, 35, 36, 37, 40, 41, 42, 43, 45, 46.

[10] *See* Bulletins 15, 25, 32, 38, 39, 40, and Circulars 13, 15, 18, 26, 28, 29, 30, 31, 32, 33, 34, 38, 39, 44, 47, 48, 49.

[11] *See* Bulletins 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 27, 28, 30, 31, 33, 34, 35, 37, 41, and Circulars 16, 19.

Bulletin 1 and Circulars 12 and 21 do not appear in any one of these three lists because they are announcements that do not contain reports of research. Circulars 1 to 11 also do not appear. These were issued only in mimeographed form.

"Reporting Educational Research" (Bulletin No. 25) and "Objective Measurement of Information" (Circular No. 44) are illustrative of publications of a more or less textbook nature. In the former, Monroe and Johnston set forth "criteria for judging educational writings," gave "illustrations of certain details of form," and described the "process of writing a report" and the "preparation of manuscript for printer." In Circular No. 44, Odell described the uses, limitations, and ways of constructing new-type tests. In addition to a general discussion of the subject, he gave examples of thirty-seven varieties of "objective or near-objective exercises," with a brief discussion of each.

"The Teachers' Responsibility for Devising Learning Exercises in Arithmetic" (Bulletin No. 31) and "Are College Students a Select Group?" (Bulletin No. 34) are illustrative of original investigations. In the former, Monroe and Clark set out to answer two basic questions: "(1) the nature and extent of the learning exercises provided by texts in arithmetic and (2) the responsibility of the teacher for supplementing a text in this respect." This task involved making analyses of: "the immediate objectives of arithmetic," "the process of learning and teaching," "the learning exercises of arithmetic," and "the learning exercises provided by texts in arithmetic." As a part of this last, the problem content of the second and third books of ten three-book series of arithmetics was analyzed. The extent to which 333 problem types appeared in these books was discovered. In Bulletin No. 34, Odell reported the results of giving intelligence tests to several thousand high-school seniors who later graduated. The first-year records of most of those who entered college were ascertained. From these data, a partial and tentative answer was given to the question used as a title for the bulletin.

During the first three years of the Bureau's existence, the writing of letters was a very prominent activity, but beginning with the academic year of 1921-22, the annual volume of correspondence has been less than one-third of that for the second and third years.[11a] It is obvious that the discontinuance of the publication and distribution of educational tests and the removal of the *Journal of Educational Research* account for a portion of the decrease in this activity, but there has been a conscious effort on the part of the present administration to curtail correspondence in order to allow more time for research. The effect of this policy is apparent in the third column of the table. Beginning with 1922-23, the publications of "reports of research and other

[11a] *See* Appendix A for a tabular summary of the number of letters written and the number of pages of publications issued during the past ten years.

scholarly writings by members of the staff" have averaged 340 pages per year.

The foregoing description of the activities of the Bureau of Educational Research during the first ten years of its existence[12] is indicative of the general status of educational research during the period. As is made clear in Chapter I, we have not clearly understood what educational research is or should be. The function of a department of educational research in a college of education has been even less clearly defined. It has been necessary for us to feel our way somewhat cautiously, and the changes in policy represent the recognition of needs for service. Under the present administration the research activities have varied widely. This policy was adopted intentionally, for it was believed that in this way we could appeal to a larger audience. Although we have carried on a number of studies in which objective methods were employed, a large portion of our resources have been devoted to research of the philosophical type. Studies of this character, together with those having to do with techniques of research, are indicative of a significant phase of our present policy.

The preparation of this bulletin has been a "family affair." For the most part, the contributions of the several members of the staff of the Bureau of Educational Research have been intermingled to such an extent that specific credit for authorship cannot readily be given. However, three major contributions should be mentioned. Dr. Odell has been chiefly responsible for the chapter on educational measurements, and Mr. Herriott for the one on curriculum construction. Dr. Odell and Mr. Engelhart, assisted by Mrs. Kinison,[13] have done most of the work on the list of reports of educational research and related materials and on the Topical Index. The entire manuscript has been edited by Miss Hull who has also made several minor contributions. Mention should also be made of the members of the stenographic staff of the Bureau, especially of Miss Helen Putnam, who have rendered various services in addition to typing the manuscript.

WALTER S. MONROE,
Director.

[12] *See* p. 61-62, 138, 139 f. for additional information.

[13] Although not a member of the staff, Mrs. Charles R. Kinison has been employed as a full-time clerk from 1926 to 1928.

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TEN YEARS OF EDUCATIONAL RESEARCH, 1918-1927

PART I

CHAPTER I

INTRODUCTION

What is educational research? Although the term "educational research" is widely used, an authoritative definition is wanting. Our educational literature contains a number of descriptive statements, but for the most part they cannot be used as criteria for identifying educational research. Furthermore, obvious differences of opinion in regard to what constitutes educational research are reflected in these statements. The situation is illustrated by the following quotations.

"Research may be defined narrowly or broadly. Its essence is careful first-hand inquiry directed to the discovery of facts."[1]

"Research aims to discover truth; it is not satisfied with a priori reasoning, nor with subjective judgments, nor with mere speculation based upon insecure and unproved data."[2]

"All sustained, systematic investigation or inquiry which seeks facts or their application is, then, research. Although investigations and inquiries concerning educational procedure are largely inductive, reflective studies that result in new applications of established principles may be included under the term educational research. Any testing of educational beliefs or theories by their consistency with ascertainable facts is research."[3]

"This, then, is the essence of research. It is a method that takes nothing for granted, that subjects every fact, every step to careful scrutiny before its acceptance, and absolutely rejects any substitute for the best fact, the best data obtainable. It keeps an open mind; it is free from prejudice; it cultivates the habit of suspended judgment, and accepts any conclusion merely as tentative, valid only so long as it bears the test of trial."[4]

"Research in educational administration seeks to discover, in the light of the purposes of education commonly acknowledged, the most efficient procedures in the organization, supervision, financing, and evaluation of the program of educational service. It results in the statement of principles or the description of procedures essential to the development of an efficient administration of schools.

"The research worker in this field employs the methods common to all fields of scientific inquiry. He arrives at the solution of his problems through reflective thinking. In some of the steps in his thinking he is assisted by more or less elaborate techniques. In others he relies solely upon the methods employed in everyday experience. In any case he inquires concerning the validity of any procedure which he proposes to use, accepting nothing solely upon the sanction of tradition or current practice. He tests the results obtained to determine whether they are consistent with all of the facts pertinent to the administrative procedure or principle under investigation. He favors objective measures and is satisfied with nothing less than competent evidence."[5]

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[1]Briggs, T. H. "Needed Research in Secondary Education," *Fifteenth Yearbook of the National Society of College Teachers of Education.* Chicago: University of Chicago Press, 1926, p. 67.

[2]Jones, A. J., (Chairman). "An Outline of Methods of Research with Suggestions for High School Principals and Teachers," *U. S. Bureau of Education Bulletin,* 1926, No. 24. Washington: Government Printing Office, 1927, p. 1.

[3]*Ibid.,* p. 5.

[4]*Ibid.,* p. 8.

[5]Alexander, Carter. *Educational Research. Suggestions and Sources of Data with Specific Reference to Administration.* New York: Bureau of Publications, Teachers College, Columbia University, 1927, p. 1.

Writings labeled educational research. Additional evidence of the vagueness of the meaning associated with the term is furnished by the titles of writings labeled educational research. The theses accepted in partial fulfillment of the requirements for the degree of doctor of philosophy in education constitute a large group of such writings.[6] The titles of the doctors' theses for degrees granted during the ten-year period 1918-27 are marked with an asterisk (*) in the list of reports of educational research given in Part II. A few of the titles are reproduced here to indicate the general nature of this group of writings.

SHUCK, M. E. The History and Development of Teachers Agencies.
ANDRESS, J. M. Herder as an Educator.
NEUMANN, G. B. A Study of International Attitudes of High School Students.
BUSWELL, G. T. An Experimental Study of the Eye-Voice Span in Reading.
JARRETT, R. J. Status of Courses in Psychology in State Teachers Colleges in the United States.
GARLIN, R. E. A Study of Educational Publicity in Texas Newspapers.
SLATER, C. P. Fundamental Principles for Purchasing Agents of Universities.
HUNTER, F. M. Teacher Tenure Legislation in the United States.
BANE, C. L. The Lecture vs. the Class-Discussion Method of College Teaching.
MASSÓ, G. Education in Utopias.
RICE, G. A. A Constructive Criticism of the Theory Underlying Educational Authority.
ANDERSON, W. N. The Determination of a Spelling Vocabulary Based Upon Written Correspondence.
SMALL, C. R. Aims and Methods of Civic Education in the Common Schools.
GAMBRILL, B. L. College Achievement and Vocational Efficiency.
CUROE, P. R. V. Educational Attitudes and Policies of Organized Labor in the United States.
OSBURN, W. J. Foreign Criticism of American Education.

The National Committee on Research in Secondary Schools has published a "Bibliography of Secondary Education Research, 1920-25."[7] The general character of the writings listed is illustrated here by the first reference appearing on pages 5, 10, 15, etc.[8] of the Bibliography.

MILLER, W. S. The administrative use of intelligence tests in the high school. Twenty-first yearbook of the national society for the study of education, 1922, p. 189-222.
MEADOWS, T. B. The status of agricultural projects in the South. George Peabody college for teachers. Contributions to education no. 13. 1924.
THORNDIKE, E. L. The effect of first-year Latin upon the knowledge of English words of Latin derivation. School and society, 18:260-70, September 1, 1923.

[6] There is undoubtedly a general understanding in graduate departments of education that the thesis for the doctorate is to be a product of educational research. The fact that a critical examination of certain theses may lead to the conviction that the label "educational research" is not merited does not prove that the department accepting the thesis did not consider it to be the result of educational research.

[7] Windes, E. E. and Greenleaf, W. J. "Bibliography of Secondary Education Research, 1920-25," *U. S. Bureau of Education Bulletin*, 1926, No. 2. Washington, 1926. 95 p.

[8] The forms appearing in the Bibliography have been retained.

Mathematical association of America. National committee on mathematical requirements. The reorganization of mathematics in secondary education. A summary of the report . . . Washington, Government printing office, 1921. 73 p. (U. S. Bureau of education. Bulletin, 1921, no. 32.)

DAWSON, EDGAR. The social studies in civic education. In Biennial survey of education, 1920-22. Washington, D. C., Government printing office, 1924. vol. 1, p. 403-18. (U. S. Bureau of education. Bulletin, 1924, no. 13.)

ALLEN, C. F. Outlines in extra-curricula activities. Little Rock, Ark., High-school print shop, May, 1924.

MAY, M. A. Predicting academic success. Journal of educational psychology, 14:429-40, October, 1923.

HOOD, W. R. State laws relating to education, enacted in 1920 and 1921. Washington, D. C., Government printing office, 1922. (U. S. Bureau of education. Bulletin, 1922, no. 20.)

Factors predetermining success in typewriting. Public school messenger (St. Louis, Mo.), 21:20. May, 1924.

THORNDIKE, E. L., and BREGMAN, E. O. On the form of distribution of intellect in the ninth grade. Journal of educational research, 10:271-78, November, 1924.

PARSONS, R. B. A study of current practice as to parent-teacher associations. School review, 29:688-94, November, 1921.

PRATT, O. C. Status of the junior high school in larger cities. School review, 30:663-70, November, 1922.

United States. Bureau of Education. Statistics of public high schools, 1921-22. Washington, D. C., Government printing office, 1922. (Bulletin, 1924, no. 7.)

BONNER, H. R. Salary outlook for high-school teachers. School review, 30:414-23, June, 1922.

BRIGGS, T. H. Prognosis tests of ability to learn foreign languages. Journal of educational research, 6:386-93, December, 1922.

PRESSEY, S. L., and PRESSEY, L. W. The relative value of rate and comprehension scores in Monroe's silent reading test, as measures of reading ability. School and society, 11:747-49, June 19, 1920.

In the *Biennial Survey of Education* for 1920-22, a section on educational research prepared by Bird T. Baldwin was included. Among the "principal contributions" listed in this section, such titles as the following appear:[9]

CARTER, ALEXANDER, and THEISEN, W. W. Publicity campaigns for school support. New York, World Book Co., 1921. 164 p.

(Editorial.) Recognizing individual differences. Elementary School Journal, 21:164-166, November, 1920.

LYMAN, R. L. The Ben Blewett junior high school of St. Louis. School Review, 28:26-40, 97-111, 1920.

PHILIPS, H. S. Report of a committee on junior high school. Denver, Colo. Elementary School Journal, 23:13-24, September, 1922.

STARK, W. E. Every teacher's problems. New York, American Book Co., 1922. 368 p.

EDWARDS, A. S. The fundamental principles of learning and study. Baltimore, Warwick and York, 1920. 240 p.

LEONARD, S. A. Essential principles of teaching reading and literature. Philadelphia, J. B. Lippincott Co., 1922. 460 p.

[9]The forms appearing in the bibliography have been retained.

SIMPSON, I. J. Silent reading; suggestions for testing and for corrective work. Baltimore, State Department of Education, 1922. 32 p.
WILEY, J. A. Practice exercises in supervised study and assimilative reading. Cedar Falls, Iowa, Iowa State Teachers' College, 1922. 112 p.
HORN, ERNEST, and ASHBAUGH, E. J. Lippincott's Horn and Ashbaugh speller. Philadelphia, J. B. Lippincott Co., 1920. 102 p.
WALTERS, RAYMOND. Statistics of registration of 30 American universities for 1920. School and Society, 13:120-128, January 29, 1921.
FRAMPTON, J. R. College extension departments and the study of music. Education, 41:192-198, November, 1920.
SNEDDEN, DAVID. Civic education. Yonkers-on-Hudson, N. Y., World Book Co., 1922. 333 p.
WILLIAMS, J. F. Organization and administration of physical education. New York, Macmillan Co., 1922. 325 p.

In a number of teacher-training institutions and colleges of education, state departments of education, and city school systems, an explicit organization usually called a "bureau" has been created for the avowed purpose of carrying on educational research. Examination of the activities of these bureaus as indicated by their publications reveals that they vary widely in type, frequently extending beyond the limits commonly assigned to educational research. In many cases it is probable that there was an explicit recognition of the activity as being outside the field of educational research, but in other cases it is apparent that the activity was considered as educational research. The following publications are labeled as research and appear to have been considered as such. However, upon examining them, one finds that they are essentially only compilations of information.

"Facts on the Public School Curriculum," *Research Bulletin of the National Education Association,* Vol. 1, No. 5. Washington: Research Division of the National Education Association, 1923, p. 310-50.
BISCHOFF, ADELE. "False Definition Test in the Seventh and Eighth Grades," *Bureau of Research in Education.* Berkeley: University of California, 1922, p. 9-13.
"Can We Afford It?" *Research Bulletin of the National Education Association,* Vol. 2, No. 4. Washington: National Education Association, 1924, p. 122-134.
KRAMER, G. A. "Improvement in the Teaching of Reading," *Bureau of Research Monographs,* No. 1. Baltimore: Department of Education, 1926. 129 p.

A general definition of educational research. The evidence presented in the preceding pages makes it clear that the meaning associated with the term "educational research" is vague. Lack of agreement is undoubtedly due to the ready acceptance of the phrase "educational research" without a systematic attempt to define it. In fact, many persons use the term without seeming to have given much if any consideration to its meaning. It is applied as a label to several types of activity. Even writers who give explicit descriptions of

educational research do not appear to have a clear and comprehensive concept of it. As the term implies, educational research is but a special phase of research in general, the "process of conscious, premeditated inquiry." The nature of research has been described by Frederic A. Ogg in the recent "Report of a Survey Conducted for the American Council of Learned Societies."

> There is no need of laboring over a definition of research. The term obviously excludes (although there is much popular confusion on the point) that which is only search by one man for what another already knows, or the mere rearranging of facts and materials. But the name is worthily bestowed on any investigative effort—in library, laboratory, field, or shop—which has for its object an increase of the sum total of human knowledge, either by additions to the stock of actual present knowledge or by the discovery of new bases of knowledge, which for the research worker, and ultimately for the future of intellectual life, is of course far the more important. Research may or may not come to success; it may or may not add anything to what is already known. It is sufficient that its objective be new knowledge, or at least a new mode of orientation of knowledge.[10]

This concept may be condensed into the statement that research is the process of conscious, premeditated inquiry for the purpose of making additions to our stock of present knowledge or of discovering new bases of knowledge. Such inquiry, for such purposes, of and in itself demands that it be carried on by the process of critical, reflective thinking. Hence, a description of the process of critical, reflective thinking about educational questions should clarify the concept of educational research. Each of the steps or phases of this process constitutes a requirement to be met if the work is to qualify in a critical sense as educational research. The first requirement is that there be a problem which is defined sufficiently to serve as a guide in collecting data. This means that in educational research, collecting data is not merely gathering facts or other information; it is rather collecting those data that are called for by the problem.

The second requirement relates to the data. It is not essential that they be objective. It is not necessary that they be quantitative. They, however, should be adequate for the problem or at least as nearly so as reasonable effort can make them. Gross inadequacy naturally invalidates the results, even if the worker has been intelligent and persistent in attempting to collect the needed data. In addition, the data must be reasonably accurate. The necessary degree of accuracy varies. Sometimes relatively large errors in quantitative data do not destroy their usefulness. In other cases, a much higher degree of accuracy is required.

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[10]Ogg, F. A. *Research in the Humanistic and Social Sciences.* New York: The Century Company, 1928, p. 13.

An equally important requirement is that the data be used critically. In educational research we seldom, if ever, work with perfect data. Hence, it is imperative that the worker know his data and use them with full recognition of any limitations that may exist.

The final requirement is that the hypotheses be subjected to critical verification.

Obviously, the application of these criteria in classifying educational writings cannot be objective. It is likely that any group of competent persons who accepted these criteria would differ in their classification of a list of educational writings; some judges would accept certain writings as research that others would doubtless reject. Another criticism of the criteria is that they do not include an explicit basis for evaluating routine compilations of data, such as the enrollment and attendance statistics of a city school system or of a state. Compilation of such data may be defended as educational research by pointing out that a clearly defined problem preceded their collection, that they are adequate and sufficiently accurate, that they have been used critically, and that the hypotheses have been subjected to critical verification. As shown on pages 35-36, some authorities are inclined to reject such activities as educational research. They appear to add the requirement that the work must not be primarily routine, not merely an assembling of facts already known to others or such as may be collected by means of relatively simple or elementary procedures.

Another weakness of the four criteria derived from the process of reflective thinking is that there is no specification of the nature of the problem. A question may be simple and narrow in scope; for example, "How many children are enrolled in ..... building?" In answering this question, one might employ the questionnaire method, interview the teachers, or visit the rooms and secure the needed data by counting the children or examining the register. The data would be adequate, valid, and reliable, but the answering of the question probably would not be classified as educational research by any competent authority. The question is too simple and too narrow, and the facts too patent. The procedures employed in collecting and using the data are merely clerical. The questions answered by a state educational directory are equally simple but broader in scope. However, the compiling of a state educational directory does not qualify as educational research. A question asking for the average size of classes in a large high school or the medians of the scores resulting from the administration of a battery of educational tests to a group of pupils is slightly more complex. A still higher degree of complexity

is attained when the question calls for the calculation of a coefficient of correlation.

How complex must a question be before the answering of it qualifies as educational research? No definite answer can be given. A general requirement is that the question require real reflective thinking rather than mere "gathering, compiling, and distributing statistical information."

Four views of educational research. With the concept of educational research set forth in the preceding pages as a basis, the several points of view of educational writers with regard to what constitutes educational research may be examined. Some writers place emphasis upon the purpose of research; others upon the character of the process and the means employed in arriving at conclusions. The following four views appear to include the more prominent interpretations.

1. Educational research as high-grade accounting and publicity. Many educators, including most superintendents and principals, appear to think of educational research as consisting of the activities of collecting, organizing, and disseminating information about schools. According to this point of view, the research worker is primarily a combination of a high-grade accountant and publicity agent. This concept is clearly indicated in the organization and activities of research departments in city school systems. The following statement is quoted from a recent announcement of the Department of Research in the Denver Public Schools.

> The department of research will take care of both instructional and administrative research. In instructional research the present comprehensive testing program will be continued. The major portion of this program is devoted to the construction and giving of tests based on new curricula. These tests are used for evaluating the courses of study and for the improvement of teaching. Another function of the testing program is the classification of pupils by means of achievement and intelligence tests. An important phase of instructional research is the direction and supervision of investigations of educational procedures, of which a large number are being carried on at the present time in the Denver public schools.
>
> In the field of administrative research the department will have charge of the following:
>
> (1) Budget preparation and research.
> (2) Building program research.
> (3) Studies of administrative functions.
> (4) All regular statistical reports.
>
> The department will also take care of miscellaneous assignments such as answering questionnaires and inquiries from other school systems, assist in the gathering of data for public school monographs, edit and prepare *The Denver Public Schools Bulletin*, and the like.[11]

[11] "The Department of Research of the Denver Public Schools," *School and Society*, 27:162-63, February 11, 1928.

Martens says: "The term 'educational research' is a vague expression that must often bear the burden of almost any interpretation which the school administrator wishes to place on it."[12] A reading of the study by Martens makes it clear that this writer is thinking of educational research as consisting of certain functions included in the administration of a city school system.[13] Courtis and Packer[14] also appear to think of educational research as a phase of school administration. They state that in a "fully developed school system, educational research will be carried on by some fourteen departments or divisions, each with a responsible head and each with research or clerical assistants." These fourteen departments are designated as: (1) sociological research, (2) child accounting, (3) organization and administration, (4) buildings and grounds, (5) organization and administration, (6) equipment and supplies, (7) "selection, classification, assignment, and promotion of both the personnel of the educational corps and of the children," (8) instructional research, (9) health education, (10) educational finance, (11) vocational guidance and continuation schools, (12) adult education and Americanization, (13) records, reports, and publicity, (14) "pure, scientific research, the development of new technical methods of measurement, new tests, new devices, and new organization of existing science."

2. *Educational research as objective methods.* Another view of educational research is that its essential characteristic is the employment of objective methods; that is, procedures such that the data collected and their interpretation are independent of the one making the investigation. In other words, the essential requirement of educational research is that opinion and prejudice be eliminated. Hence, when a person employs objective methods, he is engaging in educational research; if his methods are subjective, he is not doing so. A sub-committee of the National Committee on Research in Secondary Education commented on this view as follows:

> It may be well at this point to call attention to a marked difference of opinion regarding educational research. This difference has to do largely with the data to be used and with the importance of complete verification. Some authorities clearly indicate that the only data admissible in research are ob-

[12]Martens, E. H. "Organization of Research Bureaus in City School Systems," *U. S. Bureau of Education City School Leaflet,* No. 14. Washington: Government Printing Office, 1924, p. 1.

[13]The following twenty-eight functions are listed: testing (mental and educational), classification of school children, surveys and statistics, supervision of special classes, educational guidance, vocational guidance, devising record forms, curriculum making, publicity, test construction, professional library, information bureau, standards of promotion, attendance, placement in industry, instructional problems, school building program, textbook evaluation, supervision of elementary grades, school finance, Americanization, budgeting, psychiatry, part-time school, registration of minors, selection and placement of teachers, visual instruction, speech defects.

[14]Courtis, S. A. and Packer, P. C. "Educational Research," *Journal of Educational Research,* 1:5-19, January, 1920.

jective data, i. e., data that can be weighed and measured by definite standards and scales, and from which all subjective elements are excluded. They give as examples of this the data that form the basis for studies on the weight and height of school children, age-grade classification of pupils, achievement in reading, writing, and arithmetic measured by standard tests. They say that all research should be based upon data of such nature that anyone else could take them and come to the same or similar conclusions. Anything else than this is not research. They also affirm that research must verify conclusions.[15]

The objective-methods view of educational research is frequently implied in references to a "science of education" or "scientific method."

"During recent years the demand for a thorough and comprehensive study of schools by scientific methods has led to a number of investigations which can be offered as an optimistic beginning of a science of education. It would, indeed, be far beyond the truth to assert that science has settled all the problems of teaching and of school organization. There is, however, a very respectable body of fact which has been clearly enough defined so that it can in no wise be set aside. In certain details the requirements of a scientifically valid educational scheme are known and can be described."[16]

"The results obtained from their [educational tests] use have been so important that they bid fair to change completely the nature of schoolroom supervision by putting scientific accuracy in the place of what was often only guesswork."[17]

The same point of view seems to be held by many of those who insist that there is no such thing as educational research. Their argument is that research is not possible until we are able to secure accurate measures, and this we cannot yet do. In a recent editorial, "Education—A 'Pseudo-Science'," in the *Journal of Educational Research,* S. A. Courtis asserts that the science of education is in the "stage of biased observation and uncritical acceptance of assumptions." In elaborating this point he says:

We have measuring instruments of a sort, but no means of interpreting the results of our measurements except in terms of assumptions which have not been proved to fit the conditions. We speak of ability, capacity, nature, nurture, although none of these concepts is more than a vague suggestion of obscure trends. Who is able to define ability in any helpful way? Who has demonstrated beyond doubt that the doctrine of specificity is better than the general and specific factor theory, or than any other? We have statistical procedures and experimental techniques, it is true, but statistical analysis alone is inadequate to establish natural law. Who ever heard of experimentation in education which conformed sufficiently to the law of the single variable to enable two investigators to obtain identical results? Even repetition of educational experiments by different observers is seldom attempted because each investigator can find so many flaws in the procedures of his predecessors that he would consider it a waste of time to repeat their mistakes.[18]

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[15]Jones, A. J (Chairman). "An Outline of Methods of Research with Suggestions for High School Principals and Teachers," *U. S. Bureau of Education Bulletin,* 1926, No. 24. Washington: Government Printing Office, 1927, p. 5.

[16]Judd, C. H. *Introduction to the Scientific Study of Education.* Boston: Ginn and Company, 1918, p. 3.

[17]Cubberley, E. P. *An Introduction to the Study of Education and to Teaching.* Boston: Houghton Mifflin Company, 1925, p. 258.

[18]Courtis, S. A. "Education—A 'Pseudo-Science'," *Journal of Educational Research,* 17:131-32, February, 1928.

Although educational research is not mentioned in this statement, a reader of the editorial gets the impression that Courtis would also label our present educational research as "pseudo," because we do not yet have satisfactory measuring instruments. In other words, we do not yet have real educational research because our methods are not sufficiently objective.[19]

3. Educational research as a means of arriving at final answers to questions about education. The point of view that educational research is a means of arriving at final answers to questions about education is closely allied with the one just described; in fact, it is implied in the last three statements quoted. It is also implied in the following:

> The educational research movement is significant because it indicates a growing distrust in the adequacy of tradition and authority as the basis for rules of action.
>
> It is an attempt to get at the real facts at all cost, to learn their true significance, and to construct a new educational program in the light of the facts discovered.[20]

Formerly, educational questions and issues were debated, the best debater winning the argument, but his opponents did not consider the matter settled. Hence, it was natural that there should be a widespread desire for a procedure that would "get at the real facts" and thus yield final answers to the questions that arose. In the physical sciences, research had revealed the falseness of many popular beliefs. In agriculture and other fields of applied science, research had demonstrated the relative merits of different methods. Consequently, it was to be expected that "educational research" would be interpreted as "a means of arriving at final answers to questions about education." It is probable that most persons who have considered the meaning of educational research have associated this concept with the term.

4. Educational research as critical, reflective thinking. A relatively small group appear to think of educational research as the process of critical, reflective thinking about educational questions. They consider objective methods desirable but not necessary. Their thesis is that the thinking must be critical at all points. The data may be subjective or faulty in other respects, but they must be the best obtainable; and more important, they must be used with full recognition of their limitations. The conclusion is expected to be dependable, but not necessarily final. In fact, no definite answer may be obtained for the question being studied. This point of view with respect to educational

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[19]This concept of educational research is commented on again in Chapter III. *See* p. 46 f.

[20]Chapman, H. B. "Organized Research in Education," *Ohio State University Studies,* Bureau of Education Research Monographs No. 7. Columbus, Ohio: The Ohio State University Press, 1927. 221 p.

research is described by the sub-committee of the National Committee on Research in Secondary Education. Immediately following the description of educational research as objective methods, (*see* p. 46-48) they say:

> Opposed to this are many who contend that all data, even those called objective, have their subjective aspects; that purely subjective data based upon the judgments of teachers are valuable, often of even greater value than data that seem to be more objective, since education involves many elements not yet capable of objective determination; that opinions of people are legitimate objects of investigation and are admissible as data. They also affirm that analysis and hypothesis are in themselves research, even without complete verification. They point out the fact that many of our most valuable scientific truths and laws have been the result merely of analysis, of deductive reasoning based upon known truths, reasoning that has gone no further than hypothesis; for example, the research into differentiated content or method for differing ability groups.[21]

Under the head of "Types of Research Problems," this sub-committee lists (1) historical, (2) experimental, (3) philosophical, and (4) survey. Of the third they say: "The philosophical type of research problem was much more common some years ago when the study of education or 'pedagogy' was considered merely a branch of philosophy. It still has a very legitimate place in educational research."[22]

> The steps of philosophical research are described as: "(1) A clear statement of the concept of interest as applied to teaching; (2) an analysis of the concept to determine the various elements involved; (3) the application of each of these elements to the process of teaching to show what elements are likely to be useful and what are not, and to make clear the utility and the limitations of the concept as a whole and each element in particular."[23]
>
> "While this method is not often used exclusively in educational research, it occupies an important place in many investigations. Indeed, it might be said that one of the greatest needs of education today is this type of research, in order that there may be developed a real philosophy of education that takes into account the most up-to-date contributions of modern science."[24]

Educational research viewed as critical, reflective thinking is implied in several criticisms of what is commonly labeled educational research. For example, Newlon states: "Strictly speaking, the gathering, compiling and distributing of statistical information regarding schools is not research."[25] This writer points out that "this is very much akin to research" and that it needs to be done in a scholarly manner, but he does not appear to favor a broad definition of the term. Judd[26] also criticizes the recognition of "gathering, compiling, and dis-

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[21]Jones, A. J. (Chairman). "An Outline of Methods of Research with Suggestions for High School Principals and Teachers," *U. S. Bureau of Education Bulletin,* 1926, No. 24. Washington: Government Printing Office, 1927, p. 6.

[22]*Ibid.*, p. 12.

[23]*Ibid.*, p. 17.

[24]*Ibid.*, p. 18.

[25]Newlon, J. H. "What Research Can Do For the Superintendent," *Journal of Educational Research,* 8:106-12, September, 1923.

[26]Judd, C. H. "Needed Research in Elementary Education," *Fifteenth Yearbook of the National Society of College Teachers of Education.* Chicago: University of Chicago Press, 1926, p. 56-65.

tributing statistical information regarding schools" as research. He observes that industry in doing these things "will not serve as a substitute for real research." Apparently he believes that much of what is being published under the label of educational research is not "real research." He says:

> One finds, by reading the technical journals, that research follows in the trail of that which has been done. We have a few studies on the superior retention of the reconstructed school. We have some studies on the degree of success achieved in teaching algebra in what used to be the grades. One feels, however, that science is not the leader in the movement of reorganization. Science is merely the bookkeeper recording transactions which others have initiated and executed.[27]

In discussing statistical methods, Rugg says that "most of our so-called 'educational research' is not educational research at all."[28] The same position is taken in an editorial in the *School Review* for September, 1926, commenting on the "Bibliography of Secondary Education Research 1920-25."[29]

> As one reads the titles and comments in this bulletin, one wonders whether the demand for fundamental research has yet secured adequate recognition in the minds of the members of the committee or of secondary-school teachers and principals. At least nine-tenths of the titles cited in the bulletin refer to purely descriptive accounts of what is going on in some department of some high school. It cannot be denied that the distribution of information about practical experiments in classrooms is very desirable and worthy of all possible encouragement. There is danger, however, that a certain complacence and consequent neglect of real research will result from the use of the word "research" to cover descriptive and trivial writings on educational matters.[30]

The ascendant view: educational research as critical, reflective thinking. The preceding examples and discussion of differing views of educational research give added weight to the statement made at the beginning of the discussion that there is no generally accepted clear and comprehensive concept of educational research, that, in fact, there are wide differences of opinion. However, there is evidence that the fourth of the views of educational research described in the preceding pages is becoming the dominant one. Criticisms similar to those just cited are becoming more numerous;[31] and at the same time, the worship of objective methods seems to be passing.[32] There is also a growing recognition that to obtain a final answer to some questions is very difficult if not impossible.[33]

[27]Judd, *op. cit.*, p. 57-58.
[28]Rugg, H. O. "Statistical Methods Applied to Educational Testing," *Twenty-first Yearbook of the National Society for the Study of Education.* Bloomington, Illinois: Public School Publishing Company, 1922, p. 45-91.
[29]*See* p. 16-17 for illustrative references.
[30]"What is Research?" *School Review,* 34:488, September, 1926. (An editorial.)
[31]*See* p. 85-87 for additional criticisms.
[32]*See* p. 46-48.
[33]*See* p. 51.

The view of educational research as the process of critical, reflective thinking about educational questions is essentially the same as the broad concept which was derived from the concept that research in general is the "process of conscious, premeditated inquiry." Such a view places educational research on a par with research in other fields.

Complete educational research. Since education is essentially an applied science, there is the implication that a complete piece of educational research should yield an answer to some question about *what should be*. In practice, however, such questions are extremely difficult to answer by means of research techniques and require greater expenditures of time and energy than most investigators have at their disposal. Consequently, practically all of what we call educational research consists of studies that deal with only one, or at the most a few, phases of complete educational research; some researchers go little farther than to define problems; others merely contribute facts; still others only develop the means, such as scales, by which research may be prosecuted. The term *partial educational research* would be an appropriate title for most of what we commonly call educational research.

By directing attention to this distinction, the writers do not intend to imply that studies dealing with a phase of complete educational research may not be valuable. Fact finding studies, which according to this distinction would be classified as partial educational research, frequently make important contributions. The information they provide is very useful, if not absolutely essential, in attempting complete educational research. Likewise, studies that are restricted largely to the definition of problems or to the development of techniques frequently are valuable. However, a person who desires to understand educational research should keep this distinction in mind. Otherwise, he is likely to place an unjustifiably high value upon fact-finding studies and other types of partial educational research and as a consequence neglect complete educational research. If we view the present situation critically, it appears that one of the most serious shortcomings is the neglect of this latter type of research. Relatively few workers appear to have the concept of complete educational research, and as a consequence, many of the partial studies that are being turned out in increasing numbers will be found to represent wasted effort, because those who attempt complete educational research will find that many such investigations fail to make contributions that can be used.

The scope of educational research. What is the boundary beyond which research is not educational but belongs in another field? It is

not easy to answer this question. Presumably, a thesis accepted in partial fulfillment of the requirements for the degree of doctor of philosophy in education is considered to be within the field of education. The following titles are representative of the more unusual educational topics and of those bordering on or usually accepted as belonging to other fields of study, such as psychology, sociology, and theology.

1. PRATT, K. C. A Study of Early Infantile Behavior.
2. KEITH, H. H. The Papillary Lines of the Palm as an Index of Inherited Tendencies.
3. HORN, J. L. The Education of Non-Typical Children with Special Reference to Incorrigibles and Truants, Speech Defectives, the Deaf, the Blind, and the Crippled.
4. JOB, L. B. Business Management of Institutional Homes for Children.
5. GARBER, J. A. The School Janitor.
6. DAVIS, R. L. The Application of Motion Pictures to Education.
7. WASHBURNE, C. W. A Course in General Science for the Intermediate School.
8. MAVERICK, L. A. The Vocational Guidance of College Students.
9. GRANRUD, J. The Organization and Objectives of State Teachers Associations.
10. EAPEN, C. T. The Problem of Mass Education in India.
11. MULL, L. B. The Status of the Bible in the Public Schools of the United States.
12. SPROWLS, J. W. War and Education.
13. BENEDICT, M. J. The God of the Old Testament in Relation to War.
14. BULLER, F. P. A History of Ministerial Education in the Baptist Churches of the United States to 1845.

The first two titles suggest problems in the field of psychology. The third relates to a highly specialized phase of education. The fourth appears to belong in sociology or some division of the department of commerce. The thirteenth title does not appear to be directly related to the field of education. The remaining titles include some allusion to education, but they indicate the highly specialized problems that are being studied. Hence, if the titles of doctors' theses in education are taken as the basis for determining the scope of educational research, it is apparent that the scope is very broad. It encroaches upon psychology and a number of other related fields, including religion. The Topical Index of Part II is indicative of this breadth of scope; exclusive of duplication, this Index includes 605 topics. It may be unfortunate that educational research has not been confined to a more limited field, but for the present it does not appear that a more restricted definition of "educational" would be in conformity with prevailing practice.

The meaning of educational research in this bulletin. In describing educational research activities, it is difficult, if not impossible, to

avoid using this term with the meaning associated with it by the writers whose work is being considered. The use of "educational research" in this way tends to be confusing, because different writers appear to assign different meanings to it. However, it does not seem feasible to give the term a precise meaning, and the reader of this bulletin will find that sometimes it means one thing and sometimes another. Probably the term is most frequently used as a designation for work involving objective methods. This is due to the fact that the concept of educational research as objective methods has been very prominent during the past ten years.

The plan of the following chapters. A general account of research prior to 1918 is given in Chapter II in order to provide a background for considering the ten-year period 1918-27. A general survey of this period is presented in Chapter III. Chapters IV and V are devoted to two special fields of research, educational measurements and curriculum construction. The principal reason for giving special recognition to these two fields is that certain members of the staff of the Bureau of Educational Research were particularly interested in them. This emphasis may, however, be justified on the grounds that each refers to a relatively definite field in which there has been much activity during the past ten years. It may be noted also that summaries of research have been made for other particular fields.[34]

[34]References to a number of these summaries are given on p. 78.

CHAPTER II

EDUCATIONAL RESEARCH BEFORE 1918: THE PIONEER PERIOD

The beginning of educational research. The chronological placement of the beginning of educational research depends upon the interpretation given to the term. If educational measurements and the use of objective data are made the significant characteristics, Rice's[1] work initiated in 1894 may be taken as the beginning of our present interest in educational research. If the idea of determining the merit of an educational procedure by trial—that is, by experimentation —is made the significant characteristic, much earlier dates may be listed. Pestalozzi tested his theories by applying them in the teaching of children and noting the results. Herbart established his pedagogical seminary and small practice school connected with it soon after going to Königsberg in 1809. "This constitutes the first attempt at experimentation and a scientific study of education on the basis now generally employed in universities."[2] Froebel was noted for his kindergarten at Blankenburg. In the United States, E. A. Sheldon began his experimentation with objective materials at Oswego, New York, in 1860.[3] The work of these men and of others who might be mentioned probably would not be rated today as educational research, but the germ of the idea of experimentation may be identified in the accounts of their activities. If educational research is thought of in terms of laboratory studies of learning, another group of origins would be listed, beginning probably with Wundt's laboratory established at the University of Leipzig in 1879. If statistical methods are made the basis of our inquiry, Sir Francis Galton's development of the method of correlation, 1877-88, might be defended as an important origin.

Hence, it is obvious that the question of the beginning of educational research is very complex. Numerous origins may be cited, but it appears certain that the work of Rice is an outstanding source of what we today call educational research. The severe disapproval aroused by Rice's presentation of his spelling investigation at the meeting of the Department of Superintendence in February, 1897, is evidence that practically no educators were willing to admit the possibility of

[1]Rice, J. M. *Scientific Management in Education.* New York: Hinds, Noble, and Eldredge, 1912, Chapters V-X.

[2]Graves, F. P. *A History of Education in Modern Times.* New York: The Macmillan Company, 1922, p. 196-97.

[3]Dearborn, N. H. "The Oswego Movement in American Education," *Teachers College, Columbia University Contributions to Education,* No. 183. New York: Bureau of Publications, Columbia University, 1925. 189 p.

educational research that involved the measurement of the results of teaching. Ayres has described that event as follows:

> The educators who discussed his findings and those who reviewed them in the educational press united in denouncing as foolish, reprehensible, and from every point of view indefensible, the effort to discover anything about the value of the teaching of spelling by finding out whether or not the children could spell.[4]

Although Rice's work did not bear immediate fruit, it was a source of inspiration to Thorndike, Courtis, Stone, Ayres, and others who have contributed to the research movement. Soon after 1910, the construction of educational tests became the most conspicuous phase of educational research, although activities were not confined to this field. There were also studies of retardation and elimination, teachers' marks, eye-movements in reading, and a number of other phases of education.

Rice's proposal of a department of research. The idea of a department of educational research was suggested by Rice in 1902.[5] In this connection, he mentioned the United States Bureau of Education, the National Education Association, and "departments of pedagogy in our universities."

> Any or all of these institutions would be suitable; but they are slow in according recognition to new ideas and in carrying them to a point of practical usefulness. I do not doubt that in due course of time the work would be taken up, officially, in one little corner, by one of the bodies I have mentioned, and would leap from it to another little corner, and that in the course of twenty-five years it would be generally recognized. But why should we wait twenty-five years? Why not act at once?[6]

Rice then proposed that local school systems organize departments of research.

> While the plan is simple, it entails considerable labor; and in order that the work may be properly and systematically performed, some one must be designated to do it and to be held responsible for it. As the city superintendent has his hands full enough at present, a special office must be created for the purpose. To the superintendent, however, such assistance would be of great value. Upon him devolves the work of supervising teachers, and largely that of recommending their appointment or reappointment, of preparing courses of study, time tables for the different grades, etc.; and in all these matters the records prepared by a special assistant would be an invaluable guide. Moreover, by repeating the tests from time to time, he would have a much clearer idea of how his recommendations were working out than he can have when he shoots at random, as he now does, and there is no one to tell him when he hits or misses the target.
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> Besides taking tests and tabulating results, the work of the special assistant would lie in endeavoring to account for the differences in results on the

[4]Ayres, L. P. "History and Present Status of Educational Measurements," *Seventeenth Yearbook of the National Society for the Study of Education*, Part II. Bloomington, Illinois: Public School Publishing Company, 1918, p. 11.

[5]Rice, *op. cit.*, p. 15-16.

[6]*Ibid.*, p. 14.

part of different teachers in his locality; and it would be the duty of the special assistant in each city to work in harmony with similar assistants in other cities, in order to account for differences in results in various branches in different localities. Under these circumstances, the children could at once receive the benefit of every new discovery. The small additional expense involved in maintaining an office of this kind should not be considered any more than people consider whether, by reason of expense, their school halls shall be illuminated with candles or electric lights. If one enterprising city will take the initiative, others will be sure to follow, just as others followed the leader in engaging a city superintendent.[7]

Establishment of departments of educational research. Bureaus or departments of educational research have been created by colleges and universities, by state departments of education, and in city school systems. Chapman[8] identifies the founding of research bureaus during this period with three movements: the school efficiency movement, the adjustment movement, and the testing movement. In addition, bureaus of reference were established. The report of the New York School Inquiry, 1911-12, included the recommendation that a "Bureau of Investigation and Appraisal" be established. As a result of this recommendation, a Division of Reference and Research was established in 1913. Similar departments were organized in other cities: Baltimore, 1912; Rochester, N. Y., 1913; New Orleans, 1913; Boston, 1914; Kansas City, Missouri, 1914; Detroit, 1914; Schenectady, N. Y., 1914; Oakland, California, 1914.

The establishment of departments of educational research in educational institutions was due largely to the suggestion of S. A. Courtis, who had developed the idea of comparative testing advocated by Rice. At first, Courtis directly solicited the cooperation of superintendents and teachers in standardizing the tests he devised. As the interest in the testing movement grew, he foresaw the desirability of having centers in each state for distributing the tests, receiving and compiling the scores obtained, and inquiring into conditions that appeared unusual. Such centers were established at the University of Oklahoma, 1913; Indiana University, 1914; Kansas State Normal School, Emporia, 1914; University of Iowa, 1914; University of Minnesota, 1915. The first state bureau was the Division of Educational Tests and Measurements of the Wisconsin State Department of Public Instruction, organized in 1916.

As implied in the preceding paragraphs, the activities of the formally established departments of research in both city school systems and teacher training institutions were confined largely to the

[7]Rice, *op. cit.*, p. 15-17.

[8]Chapman, H. B. "Organized Research in Education," *Ohio State University Studies*, Bureau of Educational Research Monographs, No. 7. Columbus: The Ohio State University Press, 1927. 221 p.

field of educational measurements. A few studies were made in other fields,[9] but they were the exception rather than the rule. Furthermore, the reader should bear in mind that then, as now, many important studies were being carried on as individual enterprises, by either graduate students or members of the staffs of departments of education.

Of course the Federal Bureau of Education had been established long before these bureaus of research were organized, but it had never included any appreciable amount of research among its functions. In 1910, the Bureau began the creation of a series of divisions, such as the Division of School Administration and the Division of Higher Education, which have carried on research activities of a sort, especially the collection of data relative to various branches of educational work. In 1917, the Federal Board for Vocational Education was set up. Naturally, it has functioned most since 1918; in fact, it can scarcely be said to have carried on any research prior to 1918.

Educational research by foundations. Of the foundations, the Russell Sage Foundation was most active during this period, its Division of Education being under the direction of Leonard P. Ayres. Notable contributions were the studies of retardation[10] and of medical inspection, the development of writing and spelling scales, and comparisons of state school systems. The Carnegie Foundation for the Advancement of Teaching, the Carnegie Institute, and the General Education Board carried on or encouraged some educational research.

Encouragement of educational research by voluntary organizations. Of the voluntary organizations of educators, the National Society for the Study of Education, the Educational Research Association, and the National Society of College Teachers of Education were the most important. Most other volunteer organizations of educators and educational institutions that are well known today for the research sponsored or carried on by them have been organized or have taken up such activities since 1918. The first of the three organizations just mentioned originated as the National Herbart Society in 1895 and has functioned as a stimulus for research and discussion of research ever since. As is pointed out in Chapter V, most of the curriculum research in the period just prior to 1918 was done at the in-

[9] For example, the following was one of the first studies made by the Bureau at Emporia, Kansas:
Monroe, W. S. "Cost of Instruction in Kansas High Schools," *Kansas State Normal School Bulletin*, New Series, Vol. 4, No. 6, Studies by the Bureau of Educational Measurements and Standards, No. 2. Emporia: Kansas State Normal School, 1915. 35 p.

[10] *See* p. 41-42.

stance of this society. The Educational Research Association was organized in 1915 as the National Association of Directors of Educational Research. This association produced Part II of the *Seventeenth Yearbook of the National Society for the Study of Education,* entitled "The Measurement of Educational Products." The National Society of College Teachers of Education was organized in 1902. Its first yearbook, published in 1911, was devoted to the subject "Research within the Field of Education, Its Organization and Encouragement."[11] This yearbook furnishes a valuable index of the status of educational research at that time. The major part of the volume consists of four papers presented by Cubberley,[12] Dearborn,[13] Paul Monroe[14] and Thorndike.[15] The view of educational research taken by each of these men was determined by his interests and the aspect of education being considered. Cubberley felt that the principal need in educational administration was for the collection of facts.

> This problem of taxation and apportionment is the most thoroughly fundamental problem in the administrative side of education today. Careful statistical studies of conditions and needs should be made in each state, ... With the facts and figures thus collected, the campaign for a better financing of education can be begun.[16]

He also urged that studies be made "which would do much to help along a movement for rational county school organization."[17] Dearborn gave consideration to experimental research, his principal thesis being "that so far as the educational experimenter is concerned," many problems thus far studied mainly in the psychological laboratory "may now best be studied in the form of the school experiment."[18] He also argued for full use of data already existing in the form of school records. Paul Monroe was concerned with cooperation among research workers in education. However, he used "cooperation" in no narrow sense. The following statement makes clear both his concept of the term and to a somewhat lesser degree, the status of educational research.

> Co-operation in research is made possible now by a number of factors. Publishers are willing and anxious to bring out the product; the professional public is clamoring for light; men of wealth are willing to assist in any such effort that promises to be of value; and scientifically trained students, interested in education, are more abundant.[19]

[11] "Research within the Field of Education, Its Organization and Encouragement," *School Review Monographs,* No. 1. Chicago: University of Chicago Press, 1911. 71 p.
[12] "Fundamental Administrative Problems."
[13] "Experimental Education."
[14] "Co-operative Research in Education."
[15] "Quantitative Investigations in Education: with Special Reference to Co-operation within this Association."
[16] *Ibid.,* p. 3.
[17] *Ibid.,* p. 4.
[18] *Ibid.,* p. 6.
[19] *Ibid.,* p. 32.

Thorndike was interested in the opportunity and need for quantitative investigations, whether the investigator was primarily "interested in the student body, in the teaching staff, in the curriculum and material plant, in the receipts, in the expenditures, or in the community's aims from which all these arise . . . . the number of useful studies to be made is, for all practical purposes, infinite."[20] However, quantitative investigations were dependent upon the development of "proper units and scales." Thorndike outlined briefly several lines of investigation that should be pursued as quickly as appropriate units and scales should make it possible.

In so far as the status of educational research is concerned, the most significant facts about this group of papers are those characteristics that they possess in common: their emphasis on the need for research, the opportunity for research, in brief, their forward look; their definition of problems; and their "soft-pedaling" of accomplishments of the past. It is true that Cubberley mentioned "the pioneer studies of Elliott and Strayer,"[21] that Dearborn mentioned the experiments of Winch,[22] and that Thorndike indicated that "the first steps taken by Meriam, Strayer, and Ruediger . . . . should encourage us,"[23] and commended "the studies on eye-movements made by . . . . Dodge, Huey, Dearborn, and Judd."[24] However, these were only incidental to the more fully expressed expectation of and hope for effective educational research in the succeeding years which were epitomized by Paul Monroe: "Truly a decade of the future should show greater results than have generations of the past."[25]

Another indication of the status of educational research at this time is the establishment of the *Journal of Educational Psychology* in January, 1910. The complete title, *The Journal of Educational Psychology, Including Experimental Pedagogy, Child Physiology and Hygiene, and Educational Statistics,* is indicative of the range of the articles that have appeared in it. In the editorial announcement in the first number, the editors voiced their belief "that the time is ripe for the study of schoolroom problems in the schoolroom itself and by the use of the experimental method. Educational practice is still very largely based upon opinion and hypothesis, and thus will it continue until competent workers in large number are enlisted in the application of the experimental method to educational problems. Little more than a beginning has been made in this important movement."

[20] *Op. cit.*, p. 34.
[21] *Ibid.*, p. 4.
[22] *Ibid.*, p. 8-10.
[23] *Ibid.*, p. 40.
[24] *Ibid.*, p. 47.
[25] *Ibid.*, p. 32.

Research techniques. Before 1918, the techniques employed were crude in many respects, although most of those being used today originated during that period. The Thorndike Handwriting Scale was published in 1909; Stone Arithmetic Tests in 1908; Courtis Standard Tests, Series A in 1909; Courtis Standard Research Tests, Series B, in 1913; Ayres Handwriting Scales in 1912 and 1915; and the Binet General Intelligence Tests in 1905 and 1908. Otis and others had devised group intelligence tests just prior to 1918. Judd and his co-workers had developed apparatus for photographing eye-movements in reading. Thorndike's well-known volume, *Introduction to the Theory of Mental and Social Measurements,*[26] was published in 1904 and revised in 1913. Although Cattell and other psychologists had been using somewhat refined statistical methods, the appearance of this book may be taken as the beginning of the application of statistical methods to educational problems. Two English books, one by Brown,[27] and the other by Yule,[28] came from the press in 1911. Although Brown's treatise received some use in this country and Yule's was very commonly used in courses in statistics given by departments of mathematics and economics, they did not meet satisfactorily the need in education. In 1917, however, Rugg's *Statistical Methods Applied to Education* appeared.[29] This book, which dealt with tabulation, averages, variability, rectilinear correlation, the normal frequency curve, and so forth, in easily understood language, began at once to receive wide use. It was commonly employed as a textbook in universities and teacher-training institutions, and served to give thousands of workers in the field of education an elementary but practical knowledge of statistical methods.

Development of the questionnaire. Sir Francis Galton has been credited with having devised the method of the questionnaire about 1875,[30] but it is evident that this means of gathering data was in use prior to his time. For instance, forty years earlier, at a meeting of the Statistical Section of the British Association in Bristol in 1836,

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[26]Thorndike, E. L. *Introduction to the Theory of Mental and Social Measurements.* New York: Teachers College, Columbia University, 1904. 277 p.

The stimulation of Boas, at Columbia University, and, less directly that of Galton and his pupil and colleague, Pearson, undoubtedly had much to do with the writing of this book. Karl Pearson has unquestionably made more extensive contributions to the development of statistical methods than anyone else and is generally ranked as the leading statistician of the world. His work has appeared chiefly in *Biometrika* and the publications of the Royal Society.

[27]Brown, William. *The Essentials of Mental Measurement.* London: Cambridge University Press, 1911. 152 p.

[28]Yule, G. U. *An Introduction to the Theory of Statistics.* London: Charles Griffin and Company, 1911. 376 p.

[29]Rugg, H. O. *Statistical Methods Applied to Education.* Boston: Houghton Mifflin Company, 1917. 410 p.

[30]Henderson, E. N. "Francis Galton," *Cyclopedia of Education,* Vol. 3. New York: The Macmillan Company, 1912, p. 4.

there was submitted "a short paper on the State of Education in that City, founded on returns obtained by circular from the clergy and other ministers of religion."[31] It is significant that the writer of this paper was aware of the imperfections of the questionnaire: "Those returns were professedly and from the very nature of the mode of inquiry, partial and imperfect." In another committee report, this statement appears: "It is impossible to expect accuracy in returns obtained by circulars, various constructions being put upon the same question by different individuals, who consequently classify their replies upon various principles."[32]

The fact that the questionnaire method was being employed in the United States contemporaneously with these early investigations in England is evident from some of the activities of Henry Barnard. In his efforts to secure information relative to educational conditions in Connecticut, he made use of a questionnaire that included the following among its questions:

> When was the school-house erected?
> What arrangements are there for the seating of pupils?
> What educational periodicals do you take?
> Are the pupils classified according to age?
> What improvements do you consider desirable in the organization or administration of your school?[33]

Sigismund, in his pioneer work on child psychology, secured many of his data by means of the questionnaire. In the Introduction to *Kind und Welt*, published in 1856, he stated, "I concluded therefore to put together the results of my observations and to send them in copy to several mothers of good judgment, in order to obtain through them a collection of methodical biographies of children, from which, by induction, I might derive those laws of human development for which I had sought in vain in books."[34] A similar method was employed by Lazarus[34a] in his study of the content of children's minds. This investigation, which was carried on at Berlin, in 1870, served as a model for G. Stanley Hall,[35] who began his study in Boston in 1880 for the purpose of obtaining information relative to the knowledge possessed by

[31]Committee of the Statistical Society of Bristol. "Statistics of Education in Bristol," *Journal of the Statistical Society of London*, 4:250, October, 1841.

[32]"Report of a Committee of the Manchester Statistical Society on the State of Education in the County of Rutland in the Year 1838," *Journal of the Statistical Society of London*, 2:303, October, 1839.

[33]"Common Schools in Connecticut," *Barnard's American Journal of Education*, 1:669-722, May, 1856.

[34]Sigismund, B. *Kind und Welt*. Bruo. F., Vieweg, 1856, p. 10. Quoted by Gault, R. H. "A History of the Questionnaire Method of Research in Psychology," *Pedagogical Seminary*, 14:369, September, 1907.

[34a]Bartholomäi, F. und Schwabe. "Der Vorstellungskreis der Berliner Kinder beim Eintritt in die Schule," *Berlin Statistisches Jahrbuch*, 1870, p. 59-77.

[35]Hall, G. S. *Life and Confessions of a Psychologist*. New York: D. Appleton and Company, 1923, p. 378.

children on entering school. A written questionnaire of one hundred items was placed in the hands of several teachers, many of whom used it orally with the children. Hall says in regard to the report of this investigation, "'The Contents of Children's Minds' attracted more comment, was translated into more Languages, and set the pattern for more similar studies than anything I have ever written."[36] From that time on, the questionnaire method was much in vogue. Its use was widespread among the members of the National Society for Child Study, founded in 1893. Hall, as editor of the *Pedagogical Seminary,* received over twenty thousand returns in response to his questionnaire syllabi.[37]

The preceding paragraphs have indicated something of the development of the questionnaire as a means of collecting data in educational research. It is, unfortunately, impossible to present adequate quantitative evidence of its use during the years just prior to 1918. It is significant, however, that in 1911, Thorndike made the following statement: "One vice of statistical studies in education today is the indiscriminate use of lists of questions as a means of collecting data by correspondence."[38] This statement implies a rather widespread use of the questionnaire at this time, a use which was receiving the censure of critical workers. The fact that the questionnaire continued to be used, in spite of its recognized limitations, is shown by the fact that more than one-third of the research articles to be found in the *School Review* for 1917 were based on this technique.

School surveys. Although a number of studies embracing many features similar to those now included in school surveys had been made before 1907, the use of "survey" to refer to a study made of the Pittsburgh schools in that year appears to have been the first occasion on which the term was employed in such a manner. Very soon, however, it began to be used generally and within three or four years was commonly accepted and understood. Not only did the term become common, but the movement which it represented soon became general, as is indicated by a bibliography[39] which lists about 125 surveys[40] as being made within the ten years following 1907. Apparently there were two chief causes, one economic and the other scientific, for the rapid spread

[36]Hall, *op. cit.,* p. 381.

[37]Gault, R. H. "A History of the Questionnaire Method of Research in Psychology," *Pedagogical Seminary,* 14: 366-83, September, 1907.

[38]Thorndike, E. L. "Quantitative Investigations in Education," *School Review Monograph,* Vol. 1, 1911, p. 43.

[39]Whipple, G. M. (Edited by). "Bibliography, Divisions H and I: City Surveys and State, County, and Other Surveys," *Seventeenth Yearbook of the National Society for the Study of Education,* Part II. Bloomington, Illinois: Public School Publishing Company, 1918, p. 183-90.

[40]Many of these were not complete surveys but merely very brief and partial ones, yet such that the author of the bibliography deemed them worthy of inclusion.

of the survey movement. The chief factor in the former was the desire of the average citizen both to limit expenditures and to know for what they were being made. The scientific influences, on the other hand, had to do with the desire of educators to subject objectives, curricula, methods of teaching and of administration, and so forth, to critical analysis.

Three or four years after the Pittsburgh Survey came those of Montclair[41] and East Orange,[42] New Jersey, and immediately following these the much larger and more important one of New York City.[43] These three surveys differed from earlier ones in that their chief purpose was to inform the public concerning the schools. Moreover, the survey of New York City was the first in which educational tests were employed to assist in evaluating the efficiency of instruction, Courtis, a member of the Survey Commission, having his Series A Arithmetic Test given to about 30,000 children. Among other notable city surveys before 1918 may be mentioned that of Butte, by Strayer and others,[44] that of the Portland schools directed by Cubberley,[45] that of Salt Lake City[46] by Cubberley, that of San Antonio by Bobbitt,[47] and that of Springfield, Illinois, by Ayres.[48] By far the most complete, however, was that of the Cleveland Public Schools[49] made by Ayres with the assistance of Judd and others. The report consisted of twenty-five volumes, each dealing with a different phase of the public school system. Of the men mentioned above, three perhaps deserve the most credit for the stimulation and guidance of the school survey movement; Ayres and Cubberley were prominent in its very early stages, and Strayer became one of the leaders soon thereafter.

At first, there was a tendency to devote most attention to the legal aspects of the public schools, the status, powers, and organization of boards of education, and so forth, with buildings and building programs perhaps ranking second. Even after the New York Survey, it

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[41]Hanus, P. H. "Report on the Programme of Studies in the Public Schools of Montclair, N. J." Cambridge, Mass., 1911. 28 p.

[42]"Report of the Examination of the School System of East Orange, New Jersey." East Orange, N. J.: Board of Education, 1912. 64 p.

[43]"Final Report of Committee on School Inquiry, Board of Estimate and Apportionment." New York City: The Committee, 1911-1913. 3 vols.

[44]Strayer, G. D. (Director). "Report of the Survey of the School System of Butte, Montana." Butte, Montana: Board of School Trustees, 1914. 163 p.

[45]"Report of the Survey of the Public School System of School District No. 1, Multnomah County, Oregon, City of Portland." Portland: The Committee, 1913. 441 p. *Also published* as follows:
Cubberley, E. P., *et al.* *Portland Survey.* Yonkers: World Book Company, 1916. 441 p.

[46]"Report of a Survey of the Public School System of Salt Lake City, Utah." Salt Lake City: Board of Education, June, 1915. 324 p.

[47]Bobbitt, Franklin. "A Survey of the San Antonio Public School System." San Antonio, May, 1915. 257 p.

[48]Ayres, L. P. *The Public Schools of Springfield, Illinois.* New York: Russel Sage Foundation, 1914. 152 p.

[49]Ayres, L. P. (Director). "The Cleveland Education Survey." Cleveland: Survey Committee of the Cleveland Foundation, 1915-1916. Vols. 1-26.

was several years before the measurement of achievement came to occupy the prominent place that it has held more recently. With the exception of the use of intelligence tests, however, practically all of the phases covered in most modern school surveys were being dealt with to some extent during this period. It may be said that by 1918 the movement was thoroughly accepted, that methods were fairly well standardized, that it was even expected that progressive city systems would have school surveys made every few years, and that several state surveys[50] had already been published.

The child study movement. Although G. Stanley Hall[51] disclaims all credit for originating the child study movement, there is little reason to doubt that he, above all others, was most responsible for its early development in the United States. Reference has been made on pages 37-38 to his early work in Boston in 1880. His responsibilities at Johns Hopkins, and later, his duties as first president of Clark University, prevented his return to this field until 1893. In 1894, he printed the first of a series of questionnaire syllabi in an effort to secure data pertaining to children. Although some of these syllabi had to do primarily with child psychology, many were in the field of education, some of the topics being, "The Beginnings of Reading and Writing," "Moral Education," "School Statistics," "Number and Mathematics," "Examinations and Recitations," and "Some Characteristics and Tendencies of School Children in the Grades." The wide distribution of these questionnaire syllabi resulted in interesting people in child study, not only in the United States, but in other countries as well. Frequently, the recipient merely answered the questionnaire and returned it to Hall. Sometimes, teachers would place the questionnaire on the blackboard and get "returns" from their pupils. In a few cases, interested persons re-distributed the questionnaire, and upon writing up their investigation would send it for publication to Hall as editor of the *Pedagogical Seminary*. The magnitude of the child study movement in the early years of this century is shown by the following quotation from Hall.

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[50]Most of the so-called "state surveys" published prior to 1918 were very general, the reports occupying perhaps only twenty or thirty pages, but there had been several more complete and elaborate ones. As examples of these the following may be cited:

Sargent, C. G. "The Rural and Village Schools of Colorado. An Eight-Year Survey of Each School District, 1906-13, Inclusive," *Colorado Agricultural College*, Series 14, No. 5, 1914. 106 p.

"A General Survey of Public High-School Education in Colorado," *University of Colorado Bulletin*, Vol. 14, October, 1914. 92 p.

Brittain, H. L. "Report to the Governor of Ohio by the Ohio State School Commission." Columbus: F. J. Heer Printing Company, 1914. 352 p.

[51]Hall, G. S. *Life and Confessions of a Psychologist*. New York: D. Appleton and Company, 1923, p. 378.

The movement of child study was, however, by no means limited to questionnaire methods . . . . To understand the full scope of genetic paidology we may here refer to the annual bibliography printed at Clark by L. N. Wilson from 1898 to 1911 each year containing from three or four hundred at first to nineteen hundred titles in 1910.[52]

Research activities before 1918. Some indications of research activities prior to 1918 have appeared in the preceding pages, but a more explicit consideration is needed in order to give a true description. The facts that there were only very limited formal provisions for educational research until near the close of this period, that practically no achievements tests were available until about 1915, and that group intelligence tests were not available until after 1918 probably suggest that relatively little significant research was completed before 1918. However, examination of published reports of research reveals a number of important studies. A few of these are described briefly.[53]

1. Transfer of training. Although a number of the studies of transfer of training fall in the field of pure psychology rather than in education, it is appropriate to note the research bearing on this subject. In 1916, H. O. Rugg published an analytical summary of the "experimental literature of mental discipline."[54] He listed twenty-nine studies, the earliest of which bears the date 1890. Two others appeared before 1900 and only six others during the next five years, but twenty are listed for the period 1906-16. These facts indicate the growth of research in this field during the period considered by Rugg. It is significant that although ten of the investigators studied transfer under schoolroom conditions only one such study was made before 1906.

2. Retardation and elimination. In 1904, Superintendent Maxwell of New York City included in his annual report an age-grade study of the elementary schools of that city.[55] The appearance of this report appears to have stimulated interest in the questions of retardation and elimination. Within a period of less than ten years a number of elaborate studies were made, of which Thorndike's study, "The Elimination of Pupils from School,"[56] in 1907 appears to have been the first. It was concerned chiefly with elimination, but some attention was given to retardation and acceleration. A couple of years later, 1909, Ayres published a somewhat more comprehensive investigation under the title

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[52]Hall, *op. cit.*, p. 392.

[53]Studies in the fields of educational measurements and curriculum construction have not been included here. For research in these fields see Chapters IV and V.

[54]Rugg, H. O. *The Experimental Determination of Mental Discipline in School Studies.* Baltimore: Warwick and York, Inc., 1916. 132 p.

[55]Maxwell, W. H. "Sixth Annual Report of the City Superintendent of Schools." New York, 1904, p. 42-49.

[56]Thorndike, E. L. "The Elimination of Pupils from School," *U. S. Bureau of Education Bulletin,* No. 4. Washington: Government Printing Office, 1907. 63 p.

"Laggards in Our Schools."[57] In 1911, Strayer published a study[58] that presented age-grade data for a number of city school systems, colleges, and universities. In the same year two other reports appeared, one[59] of which dealt chiefly with the progress of pupils, rather than with age-grade conditions, and the other[60] with retardation. These pioneer studies have served as models for numerous inquiries. Most school surveys and many annual reports of city superintendents have included an age-grade table from which conclusions relative to retardation and elimination have been drawn.

As implied in the preceding sentence, measures of retardation and elimination were usually derived from an age-grade table that showed the number of pupils of each age group belonging in each grade. Obviously, this technique does not lead to accurate measures of retardation, because the age of entering school is not the same for all children. In his 1909 study, Ayres devoted one chapter to "rates of progress" and set up a progress table in which "years in school" was used instead of chronological age. However, this technique appears to have attracted relatively little attention, and during this period practically all investigators employed the age-grade technique.

3. Teachers' marks. A large number of studies prior to 1918 related to teachers' marks. Three general techniques were employed. In one group of investigations, distributions of marks were studied. The study by Meyer[61] at the University of Missouri appears to have been the first of this type to attract much attention. By tabulating separately the marks for different instructors, he found that the distributions differed widely. In a second type of investigation, the marks received by the same pupils in successive years were compared. In 1909, Dearborn[62] reported a study in which he compared the grades received by certain students in high school with those received in college. In 1911, Carter[63] compared the marks received by the eighth-grade pupils in certain elementary schools of Milwaukee, Wisconsin, with the marks these same pupils received when they entered a central

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[57]Ayres, L. P. *Laggards in Our Schools.* New York: Charities Publication Committee, 1909. 236 p.

[58]Strayer, G. D. "Age and Grade Census of Schools and Colleges," *U. S. Bureau of Education Bulletin,* No. 5. Washington: Government Printing Office, 1911. 144 p.

[59]Keyes, C. H. "Progress Through the Grades of City Schools," *Teachers College, Columbia University Contributions to Education,* No. 42. New York: Bureau of Publications, Columbia University, 1911. 79 p.

[60]Blan, L. B. "A Special Study of the Incidence of Retardation," *Teachers College, Columbia University Contributions to Education,* No. 40. New York: Bureau of Publications, Columbia University, 1911. 111 p.

[61]Meyer, Max. "The Grading of Students," *Science,* 28:243-52.

[62]Dearborn, W. F. "The Relative Standing of Pupils in High School and in the University," *University of Wisconsin Bulletin,* No. 312, 1909. 44 p.

[63]Carter, R. E. "Correlation of Elementary Schools and High Schools," *Elementary School Teacher,* 12:109-18, November, 1911.

high school. The third technique was employed by Starch and Elliott, who had facsimile copies of an examination paper in English marked by a number of teachers of that subject.[64] Later, they made similar studies in geometry and history. In 1914, F. J. Kelly reported a comprehensive study of teachers' marks[65] in which he employed each of these three techniques, as well as certain additional ones. The work of Starch and Elliott and of Kelly was very influential in arousing interest in the study of teachers' marks, and in stimulating numerous other investigations.

4. Chicago reading studies. The Chicago reading studies, due largely to the inspiration of Charles H. Judd, Director of the School of Education since 1909, involve a unique research technique. During the period of his appointment at Yale University, 1902-9, Judd devised the "kinetoscopic photographic method" for the study of eye-movements. His experience at Yale was supplemented by the work of Dearborn, who had worked with apparatus devised by Dodge. After Dearborn left the University of Chicago, Freeman continued experimentation with his apparatus; and during the scholastic year of 1913-14, Schmidt[66] carried on a study of eye-movements in reading under the direction of Judd and Freeman. In June, 1915, the Department of Education of the University of Chicago received an appropriation from the General Educational Board for laboratory studies in reading and writing. During the scholastic year of 1915-16, C. T. Gray improved the apparatus left by Dearborn and carried on a series of studies.[67] In 1918, Judd reported the results of two years of experimental work on reading, of which Gray's study was one phase.[68] Although other techniques were employed, the photographing of the eye-movements of readers is the distinctive characteristic of this experimental work. By means of a somewhat elaborate apparatus, a continuous record of the subject's eye-movements was secured on a film. By comparing this record with the text read and the conditions under which the reading was done, certain conclusions became apparent.[69]

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[64]Starch, Daniel and Elliott, E. C. "Reliability of Grading High-School Work in English," *School Review,* 20:442-57, September, 1912.

[65]Kelly, F. J. "Teachers' Marks," *Teachers College, Columbia University Contributions to Education,* No. 66. New York: Bureau of Publications, Columbia University, 1914. 139 p.

[66]Schmidt, W. A. "An Experimental Study in the Psychology of Reading," *Supplementary Educational Monographs,* Vol. 1, No. 2. Chicago: The University of Chicago Press, 1917. 126 p. Chapter II of this monograph gives a description and summary of previous studies.

[67]Gray, C. T. "Types of Reading Ability as Exhibited Through Tests and Laboratory Experiments," *Supplementary Educational Monographs,* Vol. 1, No. 5. Chicago: The University of Chicago Press, 1917. 196 p.

[68]Judd, C. H., *et al.* "Reading: Its Nature and Development," *Supplementary Educational Monographs,* Vol. 2, No. 4. Chicago: The University of Chicago Press, 1918. 192 p.

[69]The laboratory studies of reading carried on at the University of Chicago since 1917 are described in Chapter III, p. 70-71.

5. Other types of educational research. The studies described in the preceding pages do not represent all of the educational research prior to 1918. Until about 1910, history of education was a favorite field of inquiry. Referring to the period around 1900, Henry Suzzallo says:

> The methods of that day were not exact in educational thinking. The comparative and statistical inquiries of the educational administrators had not yet transformed that field of practice; nor had the educational psychologists begun their scientific work in tests and measurements. The one field of educational study which possessed a thoroughgoing scholarly method of inquiry was the history of education. It set the standard for graduate study and established an ideal of accurate investigation for students of education. Its demand set up a standard of respectability for every other field of educational thought.[70]

In commenting on the influence of Paul Monroe, Professor of History of Education at Teachers College who became a member of the faculty in 1897, Cubberley says:

> In a published list of Doctor of Philosophy degrees granted at Teachers College, from 1899 to 1921, the theses for forty-six of the one hundred and ninety-one degrees have been in the field represented by the work of Professor Monroe.[71]

There were a few studies in educational finance, but this field of educational research did not become prominent until after 1917. There were also a few attempts to evaluate methods of teaching and other procedures by experimentation under school conditions. In fact, for almost all types and fields of educational research, it is possible to identify beginnings prior to 1918.

Concluding statement. The foregoing account of the pioneer period of educational research is convincing evidence that the idea of research in education had become firmly established by 1918. The extremely hostile attitude that existed in 1897 when Rice reported his findings relative to spelling before the Department of Superintendence[72] had been replaced by a distinctly friendly attitude. By 1917, standardized educational tests were beginning to be widely used; research departments were being established in public school systems as well as in teacher-training institutions; most of the instruments and techniques of educational research employed today had been devised, at least in crude form; a number of important studies had been completed; courses in statistical methods and other research techniques were beginning to be offered in departments of education. The period

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[70] Suzzalo, Henry. "Introduction," p. xiii *in:*
Kandel, I. L., *et al. Twenty-five Years of American Education.* New York: The Macmillan Company, 1924. 469 p.

[71] Cubberley, E. P. "Public School Administration," p. 180 *in:*
Kandel, *op. cit.*

[72] *See* p. 30.

of pioneering was nearing its close; in fact, one might say that in many respects it had ended by 1918.

No attempt has been made in this chapter to summarize the results of studies, but it is obvious that, although the findings tended to be fragmentary and some are now known to be partially or wholly erroneous, several important contributions had been made to our knowledge in the field of education before 1918. It is true that some studies did little more than provide convincing evidence for beliefs growing out of experience, but even in such cases the research may be considered to have made an important contribution.

CHAPTER III

A GENERAL SURVEY OF THE PERIOD 1918-1927

Quantity production attained. As indicated in the Foreword, educational research today appears to have attained the status of "quantity production." Prior to 1918, only seven bureaus or departments of educational research had been established in teacher-training institutions, and only eighteen in connection with public school systems. In 1925-26, the latest date for which information is available, the corresponding numbers were twenty-nine and sixty-nine.[1] The trend of this period is also shown by Table I, which gives the number of doctors' theses in education by years for the period from 1918 to 1927. The average number of theses during the first five years is 55. In 1923, the number increased to 94, and in 1926 to 181. That this latter figure does not represent an abnormal or temporary condition is indicated by the fact that 189 theses were reported for 1927. This same trend toward quantity production is also shown by Table IA and Figure 1, which give the number of "Reports of Educational Research and Related Materials" by years for the period 1918 to 1927. It is clear that the rapid increase in production began about 1922. This list, which appears as Chapter II of Part II of this bulletin does not include articles in periodicals, and certain other materials, but the total number of items is 3,714. If reports of research published as articles in periodicals and all unpublished studies[2] had been included, the total would probably have been twice as large. Similar data are not available for the period 1908-17, but it is certain that the number of reports of educational research and related publications would be much less than the total for the period 1918-27. It seems reasonable to estimate that the number for the earlier period was not more than one-fourth of the total for the latter.

These facts appear to justify the use of the phrase, "quantity production" as descriptive of the present status of educational research. It is, of course, true that much of what is labeled educational research probably is not real research.[3] This fact, however, does not appear to invalidate the use of the term "quantity production."

Faith in objective methods. Another significant aspect of educational research during the past ten years is the faith in objective

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[1]Chapman, H. B. "Organized Research in Education," *Ohio State University Studies*, Bureau of Educational Research Monographs, No. 7. Columbus, Ohio: The Ohio State University Press, 1927, p. 19.

[2]A few of the doctors' theses included have not been published.

[3]*See* p. 27.

TABLE I
NUMBER OF DOCTORS' THESES IN EDUCATION, 1918-27

Institution	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	Total 1918–27
Boston College								1		1	2
Boston	1	1				1				2	5
Brown	2			2	1	1		1	1		8
Bryn Mawr						1					1
California[a]			1	2	6	6	4	2	9	8	38
Carnegie			1								1
Catholic University[b]	3	1	2	1	4	1	5		5	6	28
Chicago	1	3	4	6	7	12	7	9	4	6	59
Cincinnati								2	1	2	5
Clark		3	1		1	1		1			7
Cornell			2		2		1		4	2	11
Denver		1									1
George Washington	2	2	2		3	1			1		11
Harvard[c]	5	4	3	5	3	11	7	14	16	9	77
Illinois	1		2	2	1		2	2	1	2	13
Indiana							1	2	1	3	7
Iowa	5	3	6	1	4	5	7	11	10	16	68
Johns Hopkins					2		1		1	1	5
Kansas			1			1					2
Michigan			1	1		4	1	4	3		14
Minnesota		2		1	1	3	3	2	6	3	21
Missouri	1					1		1	4		7
New York	9	9	5	1	5	8	8	8	11	13	77
Ohio State		1	1				3	9	10	11	35
Oregon										1	1
Peabody		6	1	1	3	2	5	5	16	12	51
Pennsylvania	1		5	1	3	3	4	7	2	2	28
Pittsburgh						1		2	1	1	5
South Carolina								1			1
Southern California										1	1
Stanford		3	3	1	2	1	6		6	7	29
Syracuse	1			1	1						3
Teachers College	18	11	19	12	18	23	38	45	56	59	299
Texas						1	1		2	1	5
Tulane							1				1
Washington						2		2		7	11
Wisconsin	3		1	4		1	2	3	7	3	24
Yale				1	1	3	3	3	3	10	24
Total	53	50	61	43	68	94	110	137	181	189	986

[a]The frequencies for California include the following Ed. D. theses: 1922-5; 1923-4; 1924-1; 1925-1; 1926-3; 1927-4.
[b]Includes Catholic Sisters College.
[c]The frequencies for Harvard include the following Ed. D. theses: 1921-5; 1922-3; 1923-11; 1924-6; 1925-13; 1926-15; 1927-9.

methods. Some persons appear to think of the employment of objective methods as constituting educational research.[4] In a number of reports of educational research, there is evidence that the author believed that if his data were objective, the conclusions were indisputable, and, conversely, that if his data were lacking in objectivity, the conclusions were not dependable. For example, this faith in objective methods is reflected in a report of "The Winnetka Social-Science Investigation." The authors assert:

[4]*See* p. 22-24.

This work has proceeded to the point where we know definitely what persons, places, dates, and events must be known to the child if he is to become an intelligent member of society. We know further the relative importance of these items. . . .[5]

The complete article makes it clear that in the minds of these authors the basis of their assertion that they "know definitely" is the objectivity of the methods employed. Later in the article, they label the investigation as being "strictly scientific," which appears to mean that the conclusions were independent of the opinions or prejudices of the investigators.

TABLE IA
NUMBERS OF THESES, OTHER REPORTS AND TOTALS INCLUDED, BY YEARS*

Year	Theses	Other Reports	Totals
1918	53	165	218
1919	50	170	220
1920	61	182	243
1921	43	139	182
1922	68	238	306
1923	94	291	385
1924	110	320	430
1925	137	291	428
1926	181	364	545
1927	189	333	522
1918–27	986	2,493	3,479

*This table does not include references dated 1928 nor those for which no date is given. Also, a few references were inserted after the construction of the table and, therefore, are not included in the figures given.

This worship of objective methods was most prominent about 1922 or 1923. Recently, as observed in Chapter I, there has been a growing recognition of the limitations of objective methods and of the need for philosophical methods.

Popularization of educational research. A significant feature of the expansion of educational research has been the encouragement extended to teachers, principals, superintendents, members of faculties of colleges and universities, and others not explicitly connected with a research bureau or department. Several leaders have endeavored to stimulate classroom teachers to engage in experimentation and other types of educational research. One of the features of a recent book[6] is a plea for research by teachers. The author insists that the teacher occupies a strategic position relative to educational research.

[5]Mohr, Louise, and Washburne, C. W. "The Winnetka Social-Science Investigation," *The Elementary School Journal*, 23: 267, December, 1922.

[6]Buckingham, B. R. *Research for Teachers*. New York: Silver, Burdett and Company, 1926. 386 p.

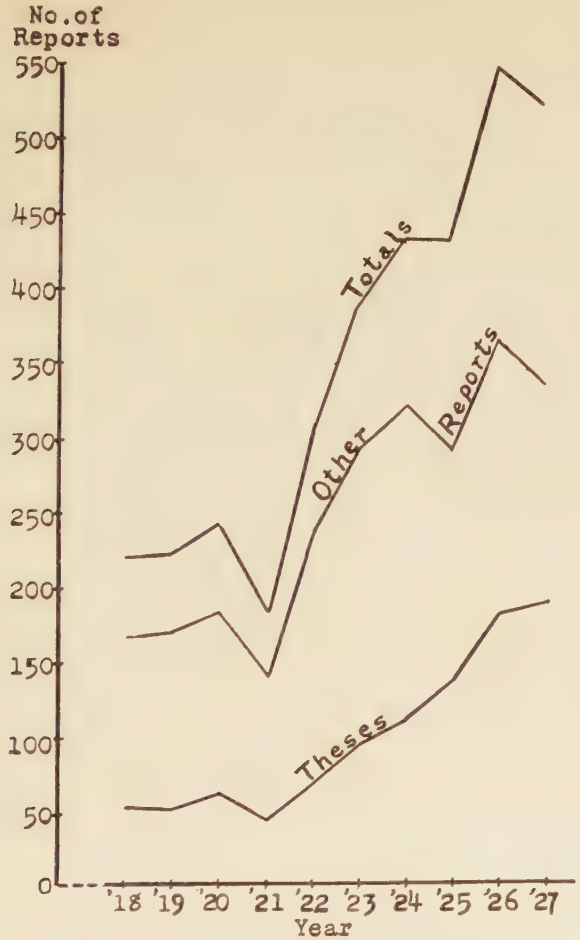

FIGURE 1. NUMBERS OF THESES, OTHER REPORTS AND TOTALS INCLUDED, BY YEARS

"As long as learning experiments are handled by psychologists alone we shall make slow progress so far as education is concerned. . . . We have a lot of piecework but no quantity production. The only persons who can supply the need in this respect are the teachers."[7]

"These problems in these bearings can never, in my judgment, be pursued by anyone as successfully as by the teacher."[8]

In connection with such appeals, teachers have been told that participation in experimentation and other types of educational research is relatively simple and requires little if any special training.

[7]Buckingham, *op. cit.*, p. 369.
[8]*Ibid.*, p. 374.

For example, in the book just referred to, it is asserted that "it is by no means necessary that you should set up formal experiments involving control groups in order to serve the cause of education as a research worker."[9] A similar assertion was made in an editorial announcement in the *English Journal* for February, 1923, page 138. The editor proposed an experiment to determine the relative merits of two instructional procedures. After explaining the plan of the experiment and soliciting the cooperation of teachers, he stated:

> No technical training in the use of measurements will be necessary, and there will be no great additions to the teacher's out-of-class labors. Only the collection of a few samples of his own pupils' compositions and fairly close adherence to definite teaching policies in two classes—these will be the total burden of each co-operator.

The popularization of educational research has been greatly augmented during the past ten years by numerous grants from foundations, other organizations, and individual contributors. The general attitude appears to be represented by the Commonwealth Fund, established in 1918. In 1921, the directors created a research fund of $100,000 a year for a period of five years. This fund was used in subsidizing, and hence making possible, investigations by various individuals and organizations. The attitude of the committee administering the fund is indicated in the following paragraph from a statement issued by the secretary of the committee at the end of the first year:

> The Educational Research Committee believes that there should be many more appeals for subventions than have thus far come to it and that requests should be made by a much wider range of institutions. Indeed the conditions of the grant and the policy of the committee are so flexible that any first-class project which can be clearly defined and budgeted is likely to receive favorable consideration. The committee meets three times a year, in the autumn, in the early spring, and in the early summer.[10]

The annual expenditure for educational research since 1917 has never been calculated, but the amount is evidently very large. The 1926 issues of *School and Society* carried announcements of appropriations and donations of more than three million dollars specifically designated for educational research. The 1927 issues carried announcements of more than a million dollars. These amounts do not include expenditures by city and university bureaus in the course of their regular work. In addition, there were undoubtedly many expenditures of the type announced which received no publicity in the pages of *School and Society*. An estimate of five million dollars a year for educational research is apparently conservative.

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[9] Buckingham, *op. cit.*, p. 377.
[10] Editorial. *Elementary School Journal*, 22: 404, February, 1922.

Although most of the grants from foundations and other sources for educational research have been made to persons experienced in such work, some of the funds have gone, either directly or indirectly, to persons rating as "amateurs." In general it has been relatively easy to secure financial assistance for a clearly defined project and the availability of funds has undoubtedly been a potent factor in popularizing this field of activity.

The pseudo-simplicity of educational research. As implied in some of the preceding paragraphs, the popularization of educational research has been stimulated by the belief that as a rule the techniques required for the study of educational problems are relatively simple. The prevailing attitude is strikingly illustrated in the following statement by T. L. Kelley:

> Some years ago I felt that it would be a rather simple matter to determine experimentally the relative influences of heredity and environment upon mental performance. This appeared to involve merely a collection of ample data of a sort easily obtainable, and the analysis of such data by prosaic methods. As a beginning it seemed well to examine tentatively all the statistical steps which would arise in the undertaking. The attempt to do so proved disheartening because of the number of difficulties which it revealed. These were both logical and mathematical. To meet the mathematical difficulties certain new measures have been derived . . . and are used here for the first time in an experimental study. To meet the logical difficulties a number of explicit functional definitions are herein given.
>
> Since the final issues of the study deal with heredity and environment it has been necessary to arrive at certain quantitative measures of these two factors, and at this point a great shortcoming (?) of the statistical method revealed itself. Whereas I had for years engaged in vigorous argument with colleagues as to the parts played in mental life by nature and nurture, I found (I might as well admit it now) that I had never to myself clearly defined either term and, still more surprising, that I could not find in the literature any precise functional definitions.[11]

Kelley's experience probably is typical of that of many researchers. When they have attempted to derive fundamental and dependable answers to apparently simple questions, they have discovered that available techniques were inadequate and that instead of educational research being so simple that it might be engaged in by any enthusiastic amateur, it required, in many instances, highly trained research specialists. Although the evidence is fragmentary, it appears that the wave of popularization is receding and that there is a growing conviction that emphasis should be placed upon the quality of the work done rather than upon quantity production.

Development of research techniques since 1918. Although developments in the fields of educational measurement and curriculum

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[11]Kelley, T. L. *The Influence of Nurture upon Native Differences.* New York: The Macmillan Company, 1926, p. v.

are described elsewhere,[12] certain points may be noted here. Many improved tests have been devised since 1918, but no essentially new techniques of test construction have been evolved. Group intelligence tests are a characteristic of the period, but Otis and other investigators had worked out the general procedure before this date. The achievement quotient (A. Q.) and similar derived scores probably represent the most original developments in educational measurements. Job-analysis, the most conspicuous curriculum construction technique, may be traced back to studies prior to 1918.[13]

As pointed out on page 31, the idea of determining the merits of a proposed method of teaching or other procedure by experimentation under school conditions was advocated by Rice and may be identified in earlier events, but this type of educational research was not prominent during the period prior to 1918. Only ten of the twenty-nine investigations of transfer of training listed by Rugg in 1916 involved experimentation under school conditions.[14] An analysis of the volumes of the *Journal of Educational Psychology* from its beginning in 1910, to 1927, revealed a very marked increase since 1917 in the number of experiments under school conditions.[15] The Teachers College Contributions to Education reflect a similar trend.

The refinement of the technique of experimentation is one of the most significant developments of this period. Most of the earlier experimentation was not controlled; that is, a control group was not provided. During the present period, a control group has been recognized as essential and the availability of group intelligence tests has greatly facilitated the formation of equivalent groups.[16] The rotation method was devised to neutralize the effect of factors that could not otherwise be controlled or equalized. In addition, there has been a much clearer recognition of the limitations of the experimental method and consequently a more critical interpretation of the data collected.[17]

The questionnaire has continued to be widely used as an instrument for collecting data. Naturally it has continued to be criticized and there is a growing conviction that unless the sender of a questionnaire is sponsored by a reputable educational organization, his communication should find its way into the wastebasket. Some of the critics of the questionnaire, however, are becoming more discriminating

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[12] *See* Chapters IV and V.
[13] *See* p. 118 f.
[14] *See* p. 41.
[15] Thirteen were reported in the first eight volumes and fifty-three in the next ten.
[16] The "Selection of Experimental Subjects" forms one chapter of McCall—*How to Experiment in Education.*
[17] Several refinements of the experimental method are apparent in Collings, Ellsworth. *An Experiment with a Project Curriculum.* New York: The Macmillan Company, 1923, p. 7-21, 225-83.

and are pointing out that it is an appropriate instrument for collecting facts that are not directly accessible to the investigator. Its use for collecting opinions is generally condemned. The following criticism by Butterfield probably represents the attitude of a large group.

> A questionnaire is not a device to record facts for future evaluation. It is a method by which graduate degrees may be brought to earth. No degree without a dissertation, no dissertation without a questionnaire. I know this because I am a courteous man—doubtless the result of study of future less vivid conditions—and I run an efficient office where all letters must promptly be answered. As a result I answer a questionnaire a day and rejoice that I am godfather to many degrees. . . . For a time I was disturbed when I was obliged to give decisive answers to questions in fields where I had not the slightest interest or experience. At last I began to see the true principle of the questionnaire. The individual answer may be ill-considered or given in jest or even written on the wrong line. It may be the answer of a philosopher or a fool, a savant or a sophomore. It does not matter even if all the answers are wrong. All that is necessary is to gather them in sufficient number, count them, give them appropriate weights, apply the formula and in some mysterious way pure truth is the result.[18]

There has been an increasing disposition to give attention to errors and other limitations of data. It is now generally known that test scores are subject to both constant and variable errors[19] and the more critical test-makers now attempt to furnish information in regard to the probable magnitude of these errors in the scores yielded by their tests.

The period since 1917 has been notable for the number of books dealing with statistical methods applied to education. Alexander's *School Statistics and Publicity*[20] appeared in 1919. No volumes devoted wholly to educational statistics appeared within the next five years, but there were a number on educational measurements which included one or more chapters on statistical methods.[21] The year 1925 was marked by the appearance of four new texts, by Otis,[22] Rugg,[23]

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[18]Butterfield, E. W. "The Plenary Inspiration of the Dotted Line," *Educational Review*, 68: 2, January, 1925.

[19]For evidence of these errors, *see:*

Monroe, W. S. "The Constant and Variable Errors of Educational Measurements," *University of Illinois Bulletin*, Vol. 21, No. 10, Bureau of Educational Research Bulletin No. 15. Urbana: University of Illinois, 1923. 30 p.

[20]Alexander, Carter. *School Statistics and Publicity.* Boston: Silver, Burdett and Company, 1919. 332 p.

[21]Among the most widely used of these are:

Gregory, C. A. *Fundamentals of Educational Measurement.* New York: D. Appleton and Company, 1922. 382 p.

McCall, W. A. *How to Measure in Education.* New York: The Macmillan Company, 1922. 416 p.

Monroe, W. S. *An Introduction to the Theory of Educational Measurements.* Boston: Houghton, Mifflin Company, 1923. 364 p.

Trabue, M. R. *Measuring Results in Education.* New York: American Book Company, 1924. 492 p.

[22]Otis, A. S. *Statistical Method in Educational Measurement.* Yonkers-on-Hudson, New York: World Book Company, 1925. 337 p.

[23]Rugg, H. O. *A Primer of Graphics and Statistics for Teachers.* Boston: Houghton, Mifflin Company, 1925. 142 p.

Thurstone[24] and Odell.[25] A year later, one by Garrett[26] appeared. Still more recently, Holzinger[27] has produced one that is easily the most complete and advanced text in educational statistics to date. In addition to the texts already mentioned, reference should be made to Kelley's Statistical Methods,[28] which, although written from the mathematical, rather than the educational point of view, has been used extensively by educational statisticians. This book contains a number of new formulae, many of which deal with the determination of the reliability of standardized tests and other measuring instruments.

A study of statistical writings and of procedures actually employed during the past few years reveals that the outstanding tendency has been toward the development of a decidedly critical attitude. Increasing emphasis has been placed upon reporting probable and standard errors, coefficients of reliability, and other measures of reliability in all cases to which they apply. The interpretation of statistical measures and procedures, especially of coefficients of correlation, has also received considerable attention.[29] As evidence of the trend just referred to, Table II has been prepared. It shows the number of articles in the *Journal of Educational Psychology*[30] in which the coefficient of correlation was used, and the number and per cent of times in which the probable error of the coefficient was given. It will be seen that for the eight-year period ending in 1917 the probable error was given in only slightly more than one-third of the articles. For the ten-year period from 1918 to 1927, it appeared in 45 per cent of the articles. Furthermore, the number of articles in which the coefficient of correlation appeared has been more than three times as great in the past ten years as in the eight years preceding that time.

The present situation with respect to statistical methods applied to education may be summarized as follows: considerable critical and constructive effort is being put forth; an adequate supply of high-class treatises has been published; teacher-training institutions recognize that teachers should be able to use at least some of the simpler methods as well as to understand discussions in which they are employed;

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[24]Thurstone, L. L. *The Fundamentals of Statistics.* New York: The Macmillan Company, 1925. 237 p.

[25]Odell, C. W. *Educational Statistics.* New York: Century Company, 1925. 334 p.

[26]Garrett, H. E. *Statistics in Psychology and Education.* New York: Longmans, Green and Company, 1926. 317 p.

[27]Holzinger, K. J. *Statistical Methods for Students in Education.* Boston: Ginn and Company, 1928. 372 p.

[28]Kelley, T. L. *Statistical Methods.* New York: The Macmillan Company, 1923. 390 p.

[29]Odell, C. W. "The Interpretation of the Probable Error and the Coefficient of Correlation, *University of Illinois Bulletin,* Vol. 23, No. 52, Bureau of Educational Research Bulletin No. 32. Urbana: University of Illinois, 1926. 49 p.

[30]The *Journal of Educational Psychology* is the most notable of several educational periodicals that have devoted considerable space to articles dealing with the derivation, criticism and interpretation of statistical procedures.

TABLE II

USE OF THE COEFFICIENT OF CORRELATION WITH THE PROBABLE ERROR IN THE "JOURNAL OF EDUCATIONAL PSYCHOLOGY," 1910-27

1. Year	2. Number of times used[a]	3. Number of times P. E. given[b]	4. Per cent of times P. E. given	1. Year	2. Number of times used[a]	3. Number of times P. E. given[b]	4. Per cent of times P. E. given
1910	3	0	0	1918	13	4	31
1911	3	2	67	1919	11	4	36
1912	4	1	25	1920	14	8	57
1913	13	2	15	1921	9	6	67
1914	5	2	40	1922	15	7	47
1915	10	2	20	1923	25	9	36
1916	7	4	57	1924	28	13	46
1917	11	7	64	1925	20	10	50
				1926	21	8	38
				1927	21	11	52
1910–17	56	20	36	1918–27	177	80	45

[a]In counting the number of times the coefficient of correlation was used, each article in which one or more coefficients appeared was counted as one.

[b]If the probable errors of any of the coefficients of correlation given in an article were stated, the article was classified under this heading.

finally, such ability is possessed by an ever-increasing number of teachers.

Attention to the technique of reporting educational research. There has been a growing interest, during the past ten years, in the reporting of educational research. More effort is being expended today than formerly in so organizing reports of investigations that readers may grasp the salient points and may locate particular items of information with a minimum expenditure of time and effort. Much attention is being given to mechanical devices, such as paragraph headings, which enable the reader to follow easily the trend of thought and prevent his being lost in the maze of details.

A comparison of the eight Teachers College Contributions published in 1918 with a like number selected at random from those published in 1927 reveals several improvements in form in the latter. In the first place, the introductory material, including the definition of the problem, sources of data, and method of procedure, are given less prominence in the studies of 1918 than in those of 1927. In the former, such material usually appears in the Preface, Foreword, or Introduction on a page or pages preceding Chapter I. In the 1927 Contributions, with one exception, the entire first chapter is devoted to the introductory material, and in most cases, the different divisions, statement of problem, sources of data, etc., are distinctly marked off by means of paragraph or center headings. The use of paragraph headings as a

means of indicating units of thought within chapters appears to be much more common in 1927 than in 1918. This is indicated by the fact that five of the 1927 studies examined as compared with one of the 1918 studies make use of paragraph headings.

There seems to be a greater tendency among present-day writers than among those of ten years ago to include lists of tables in reports containing a number of tables. C. V. Good points out the need for such procedure by saying, in regard to cases in which tables are given and no list of them is included:

> The reader finds it necessary to thumb through the volume until he locates the desired data, whereas if a list of tables is provided the search for a particular item of information is greatly facilitated. Certainly if statistical data are worth including in a book, it seems that the reader deserves the guidance of simple mechanical aids in locating desired information.[31]

All but one of the reports of investigations in 1918 contain tables (ranging in number from 9 to 75 per report), but in only one case is a list of tables given. All of the studies of 1927 examined include lists of tables. Moreover, in the studies of ten years ago, there is evidence of carelessness in referring to tables. There are many instances of references appearing at a distance of three or four pages from the tables to which they refer and four instances of tables to which apparently no reference whatever is made in the text.

Another distinction between the two groups of reports which may be worth noting is in regard to the number of footnotes. Although there is no appreciable difference in the average length of the reports, the average number of footnotes in those of 1927 is 200 as compared with approximately half that number in those of 1918. This fact may be interpreted as an indication of the present attempt to simplify reports of research by subordinating supplementary material to that which is essential to the trend of thought.

Finally, there appears to be considerable improvement in the form of bibliographical references used in the reports of research in 1927 as compared with those of 1918. This improvement is mainly in the completeness of references; there was and still is marked inconsistency in form of references, not only among different writers but also in individual writings. Typical examples of book references appearing in the studies of 1918 are the following:

> Davis, C. O. Public Secondary Education.
> Terman: *School Building Survey, Denver, Colo.*, 1916.
> Beverly, Robert, History of Virginia, 1722, 238.

In decided contrast to these inadequate references are the following, which are representative of 1927 educational writings in their

[31]Good, C. V. "Editing and Errors," *School and Society*, 27: 147, February 4, 1928.

completeness of information as well as in their variability of form:

Reisner, Edward H. *Nationalism and Education since 1789.* The Macmillan Co., New York City, N. Y. 1922. pp. 575.

Cubberley, E. P. Public School Administration in the United States. Houghton Mifflin Company, Boston, 1922, 479 pp.

Alexander, Thomas. *Prussian Elementary Schools.* New York: The Macmillan Company, 1918. 571 pp.

There are other evidences of interest in the form of educational writings. For instance, C. V. Good and D. A. Worcester, in two articles[32] which have appeared in recent numbers of *School and Society,* comment on weaknesses of form of current educational textbooks, and give suggestions for improvement. The point of view of these two articles is suggested in the following:

> The strong book with a real message, by virtue of its content value, may transcend lapses in mechanics and form. However, an interesting observation is that, almost without exception, educational writings most suggestive on the content side are almost perfect in the mechanics of construction.[33]

The popularity of such writings as Reeder's little book, *How to Write a Thesis,*[34] is also indicative of the recognized need for authorized forms in educational writings. The existence of such a need is further evidenced by the fact that so much interest has been exhibited in the bulletin, "Reporting Educational Research," by Monroe and Johnston,[35] that a large reserve stock has been exhausted in a relatively short time.

Formal provisions for educational research. Another view of the educational research activities of this period is obtained by a survey of the formal provisions for conducting and encouraging research. Since a comprehensive report of organized research is available,[36] no attempt will be made to give a full account of such provisions. Rather, the purpose here is to give a broad survey, indicating the research agencies involved, their extent, and the character of the research carried on or encouraged. For convenience, the formal provisions for educational research are considered under five heads: (1) city school systems, (2) colleges and universities, (3) foundations, (4) federal and state governments, and (5) others.

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[32]Good, *op. cit.,* p. 146-50.
Worcester, D. A. "Some Characteristics of a Good College Text-Book," *School and Society,* 27: 193-96, February 18, 1928.

[33]Good, *op. cit.,* p. 146.

[34]Reeder, W. G. *How to Write a Thesis.* Bloomington, Illinois: Public School Publishing Company, 1925. 136 p.

[35]Monroe, W. S. and Johnston, N. B. "Reporting Educational Research," *University of Illinois Bulletin,* Vol. 22, No. 38, Bureau of Educational Research Bulletin No. 25. Urbana: University of Illinois, 1925. 64 p. (Out of print.)

[36]Chapman, H. B. "Organized Research in Education," *Ohio State University Studies,* Bureau of Educational Research Monographs, No. 7. Columbus: The Ohio State University Press, 1927. 221 p.

1. Provisions in city school systems. During the past ten years, the number of research bureaus in city school systems has greatly increased, although the annual rate of increase has been somewhat lower since 1922.[37] Chapman[38] found 69 such bureaus in the United States, out of a total of 105 bureaus of educational research. The typical city bureau was established in 1920, has a staff of four persons, a salary budget of $7,800, an operating budget of $1,500, and has studied seven distinct projects during the course of a year.[39]

2. Provisions in colleges and universities. Chapman[40] has described the typical bureau in teacher-training institutions as being established in 1920 and staffed by three persons, each of whom devotes a small portion of his time to the bureau. The typical university bureau was established in 1922, and has a staff of five persons who devote all or nearly all of their time to the bureau. However, the provisions for educational research in universities and teacher-training institutions vary widely. In some instances, a "Bureau of Educational Research" is little more than a name. The "director" is a member of the instructional staff whose teaching schedule has been reduced somewhat so that he may engage in research. The "staff" consists of a stenographer or clerk and there is usually a small appropriation for maintenance and printing.[41] In such cases a very large portion of the collecting and tabulating of data is done by students working on graduate theses or assignments in courses. At the other extreme we have the Institute of Educational Research at Teachers College, Columbia University, which has a large staff and annual budget. Its activities are relatively independent of the instructional divisions of Teachers College.

This Institute was established by action of the trustees, February 10, 1921, to promote the scientific study of education in cooperation with the several departments of the College and with other institutions interested in investigation and research.[42] It was organized in three divisions as follows: (1) Division of Educational Psychology, with Edward L. Thorndike as director, (2) Division of School Experimentation, with Otis W. Caldwell as director, (3) Division of Field Studies, with George D. Strayer as director. The extent of its activities during the first year of its existence is indicated by the state-

[37] Chapman, *op. cit.*, p. 210-11.
[38] *Ibid.*, p. 20, 118-21, 210-12, 219-20.
[39] *Ibid.*, p. 210-12.
[40] *Ibid.*, p. 212.
[41] The writer knows of two bureaus that are essentially self-supporting.
[42] "The Trustees Establish an Institute of Educational Research," *Teachers College Record*, 22: 259, May, 1921.

ment of the Dean of Teachers College in his report for the academic year ending June 30, 1922, that altogether, the Institute has received during the year in gifts and grants for special studies the sum of $47,725, besides some $9,900 expended upon the Educational Finance Inquiry for work done at the College, and $130,000 received from the General Education Board for the support of The Lincoln School.

In the report of the Dean of Teachers College for the academic year ending June 30, 1924, the character and range of the studies completed during the first three and one-half years of its existence are indicated by the following lists:

I. DIVISION OF EDUCATIONAL PSYCHOLOGY

Subject. An Inventory of English Constructions.
Publication. Report in progress.
Financed by: Teachers College.

Subject. The Psychology of Algebra.
Publication. *The Psychology of Algebra,* 483 p. The Macmillan Company, 1923; also separate articles in various educational and other scientific journals.
Financed by: The Commonwealth Fund.

Subject. Tests for Vocational Guidance of Children.
Publication. *Tests for Vocational Guidance of Children Thirteen to Sixteen,* Contributions to Education No. 136, Teachers College.
Financed by: The Commonwealth Fund.

Subject. New-Type Examinations in Algebra and Ancient History.
Financed by: College Entrance Examination Board.

Subject. The Teaching of Latin.
Publication. Parts of the official report of the Latin Inquiry, also separate articles in educational journals.
Financed by: General Education Board and American Classical League.

Subject. Fundamental Units of Intellect and Capacity.
Publication. Report in progress. Separate articles have appeared in educational journals.
Financed by: Carnegie Corporation of New York.

Subject. Mental Discipline in the High School Subjects.
Publication. Report in *Journal of Educational Psychology,* Vol. 15, p. 1-22 and 83-98; also separate articles in other educational journals.
Financed by: The Commonwealth Fund.

Subject. Application of Vocational Tests.
Financed by: The Commonwealth Fund.

Subject. Study of the Educational and Industrial Histories of Two Thousand Children.
Publication. Report in progress.
Financed by: The Commonwealth Fund.

Subject. Experiment with a Class of Children of Exceptionally High Intellectual Status.
Publication. Report in progress. Partial report in *Twenty-Third Yearbook of National Society for the Study of Education,* p. 221-237 and 275-289.
Financed by: Carnegie Corporation of New York.

II. DIVISION OF SCHOOL EXPERIMENTATION

1. General

Subject. Rural Experimental School. (In cooperation with the Board of Education, Allamuchy Township, N. J.)
Publication. Report in progress.
Financed by: Mr. Felix M. Warburg.

Subject. Extent, Nature and Causes of Failure of School and Community to Deal Effectively with Special Cases. (In cooperation with Public School No. 165 Manhattan.)
Publication. Report in preparation.
Financed by: The Laura Spelman Rockefeller Memorial.

Subject. The Psychology of Children's Fears. (In cooperation with the Hecksher Foundation.) The Value of Eggs in the Diet of Young Children. (In cooperation with the Manhattanville Day Nursery.)
Publication. Reports in progress.
Financed by: The Laura Spelman Rockefeller Memorial.

2. In connection with The Lincoln School

Subject. The Lincoln School.
Publication. *See* bulletins published by The Lincoln School.
Financed by: General Education Board.

Subject. The Present Conditions and Tendencies of History Teaching in Elementary and Secondary Schools.
Publication. Report in progress.

III. DIVISION OF FIELD STUDIES

Subject. Chamber of Commerce Inquiry.
Publication. Report of the American City Bureau.
Financed by: The Commonwealth Fund.

Subject. Civic Education.
Financed by: Inter-racial Council and Mr. Felix M. Warburg.

Subject. Educational Activities of the Young Men's Christian Association.
Publication. Report published by the Y.M.C.A., New York City.

Subject. Baltimore School Survey.
Publication. Report of Board of School Commissioners, Baltimore.
Financed by: City of Baltimore.

Subject. Stamford School Survey.
Publication. Report of The School Committee, Stamford, Conn.
Financed by: Town of Stamford.

Subject. Atlanta School Survey.
Publication. Report of Board of Education, Atlanta, Ga.
Financed by: City of Atlanta.

Subject. Augusta School Survey.
Financed by: City of Augusta.

Subject. Springfield School Survey.
Publication. Report of The School Committee, Springfield, Mass.
Financed by: City of Springfield.

Subject. Providence School Survey.
Publication. Report of The School Committee, Providence, R. I.
Financed by: City of Providence.

The total of the contributions for the period is given as $690,399.00 and the statement is made that Teachers College had contributed directly or indirectly as much more. In addition to the Institute of Educational Research as originally organized, a Practical Arts division had grown up by 1924 and active experimentation was being carried on in the Horace Mann School. The Report of the Dean of Teachers College for the academic year ending June 20, 1927, lists an Institute for Child Welfare Research and a Bureau of Curriculum Research which appears to be independent of the Institute of Educational Research.

Another outstanding university research bureau is the Iowa Child Welfare Research Station. The station was established in 1917 at the University of Iowa for the purpose of investigating the "best methods of conserving and developing the normal child, training research students, and dissemination of information obtained through research."[43] The work of the station is indicated by the following divisions of its staff: Psychology, Anthropometry, Nutrition, Sociology, and Eugenics. Although primarily concerned with research, the station also serves the state in many phases of child welfare work. It furnishes psychological and physical examinations to children free of charge, and provides mothers with information relative to the care and feeding of children. The results of investigations are published in the series of monographs entitled, "The University of Iowa Studies in Child Welfare." Less technical accounts appear in the "Service Studies" of the Station, or in the Extension Bulletins of the University of Iowa Extension Division.

The Bureau of Educational Research at the University of Illinois is the research division of the College of Education. The present staff

[43] "Administration and Scope of the Iowa Child Welfare Research Station," *University of Iowa Studies, Aims and Progress of Research,* Vol. 1, No. 14. Iowa City: University of Iowa, 1924, p. 6.

consists of eight persons.[44] A limited amount of teaching is done by three of them, but the other five devote all of their time to research. During the first three years of its existence, the Bureau of Educational Research permitted graduate students to undertake some of its projects as a basis for theses or contributed clerical service or other assistance to projects originated by certain students. This practice proved to be unsatisfactory and was discontinued as soon after September, 1921, as outstanding obligations were fulfilled. Since then the projects of the Bureau of Educational Research have been independent of the activities of graduate students. The work on Bureau projects is done by either the members of the Bureau or by clerks employed by the hour. Occasionally the work of a graduate student has been published, but in such cases the Bureau did not contribute to the project until the student had completed his work on the manuscript.[45]

3. Provisions by foundations. In 1910, Ayres described "Seven Great Foundations."[46] He set forth briefly the origin, purposes, and activities of these institutions.[47] Only slight mention was made of educational research in connection with the activities of these foundations; in fact, the only two references were in connection with The Carnegie Foundation for the Advancement of Teaching and The Russell Sage Foundation. With respect to the former, Ayres said, ". . . . from time to time the foundation publishes in pamphlet form studies in education."[48] Somewhat fuller mention was made of the studies of medical inspection in schools, retardation and elimination, open-air schools, and educational measurements carried on by The Russell Sage Foundation.[49] Today a description of the activities of foundations would be wholly inadequate if it did not contain an account of the relation of the foundations to educational research.

Of the many foundations established with an educational purpose, not all engage in or subsidize educational research. Among such may be named The John F. Slater Fund for the Education of Freed-

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[44]*See* the Foreword for additional information about the Bureau of Educational Research at Illinois.

[45]*See* Bulletins 24, 27, 28, 35, and Circulars 20, 24, 26, 28, 32, 39, 40, 47.

[46]The original descriptions were published in a series of seven articles in the *Journal of Education* during September, October, and November, 1910. These articles were later collected, brought up to date by minor alterations, and published in a small booklet:
Ayres, L. P. *Seven Great Foundations.* New York: Russell Sage Foundation, 1911. 79 p.

[47]The seven are:
1. The Peabody Education Fund
2. The John F. Slater Fund for the Education of Freedmen
3. The Carnegie Institution of Washington
4. The General Education Board
5. The Carnegie Foundation for the Advancement of Teaching
6. The Russell Sage Foundation
7. The Anna T. Jeannes Foundation

[48]Ayres, *op. cit.*, p. 56.

[49]*Ibid.*, p. 67-70.

men and The Anna T. Jeannes Foundation. Only indirectly can The Peabody Education Fund be said to subsidize educational research through endowment of the George Peabody College for Teachers. The Russell Sage Foundation had a Division of Education through which it carried on much educational research for several years, but this department was discontinued in 1921.

During the past ten-year period, the two national benefactions that have exerted the greatest influence on educational research are the Carnegie Corporation of New York and The Commonwealth Fund. In 1920, the Commonwealth Fund undertook a five-year program of educational research, the purpose of which was stated to be "primarily the stimulation of educational research."[50] An Educational Research Committee[51] was appointed which made a large number of grants to various studies. These grants totaled approximately $100,000 a year for six years.[52] Among the more ambitious studies financed in whole or in part by grants of this Fund are The Educational Finance Inquiry made under the auspices of The American Council on Education;[53] the California Curriculum Study;[54] the summaries of educational investigations relating to arithmetic and to reading;[55] a survey of the Winnetka, Illinois, Public Schools,[56] and the investigations reported in the first two volumes of *Genetic Studies of Genius.*[57] In "a

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[50]"The Commonwealth Fund, Annual Report, 1927." New York: The Commonwealth Fund, 1928, p. 53.

[51]The committee consisted of:

Max Farrand, Chairman
Samuel P. Capen, Secretary

James R. Angell	Barry C. Smith
Leonard P. Ayres	Henry Suzzallo
Charles H. Judd	Edward L. Thorndike

Ibid., p. 7.

[52]"The Commonwealth Fund, Annual Report, 1926." New York: The Commonwealth Fund, 1927, p. 55.

The appropriations for the additional year beyond the original five-year period were made for the completion of studies then under way. The question of permanent continuance of the work was under consideration. With the resignation of Max Farrand as Director of the Division of Education, the work was discontinued. ". . . the Board of Directors felt that the primary purpose of the original program had been effected. Educational research is now being carried on by many organizations in many different fields, and it is believed that further grants by the Fund are not necessary in view of this development."

"The Commonwealth Fund, Annual Report, 1927." New York: The Commonwealth Fund, 1928, p. 54.

[53]The Educational Finance Inquiry Commission produced thirteen volumes, which were published by The Macmillan Company.

[54]Bagley, W. C. and Kyte, G. C. *The California Curriculum Study.* Berkeley: University of California Printing Office, 1926. 430 p.

[55]Buswell, G. T. and Judd, C. H. "Summary of Educational Investigations Relating to Arithmetic," *Supplementary Educational Monographs,* No. 27. Chicago: University of Chicago, 1925. 212 p.

Gray, W. S. "Summary of Investigations Relating to Reading," *Supplementary Educational Monographs,* No. 28. Chicago: University of Chicago, 1925. 275 p.

[56]Washburne, C. W., Vogel, Mabel, and Gray, W. S. "A Survey of the Winnetka Public Schools," *Supplementary Educational Monograph, Journal of Educational Research.* Bloomington, Illinois: Public School Publishing Company, 1926. 135 p.

[57]Terman, L. M., *et al.* "Mental and Physical Traits of a Thousand Gifted Children," *Genetic Studies of Genius,* Vol. I. Stanford University: Stanford University Press, 1925. 648 p.

Cox, C. M., *et al.* "The Early Mental Traits of Three Hundred Geniuses," *Genetic Studies of Genius,* Vol. II. Stanford University: Stanford University Press, 1926. 842 p.

printed list of the publications of the Commonwealth Fund in educational research" which "have been accredited in whole or in part to the grants of the Commonwealth Fund for the encouragement of Educational Research," a list of fifty-nine books, monographs, and the like are given and a note is appended, stating, "In addition there have been numerous articles published in educational journals."[58]

The Carnegie Corporation of New York has published (through the Macmillan Company) five "preliminary studies in adult education." In addition, they have made grants to twelve organizations[59] for investigations in the field of education. The following items taken at random from the Carnegie Corporation's reports of expenditures for the years 1922 to 1927 are indicative of the educational research to which support has been given:

Beneficiary	*Name of Appropriation*	*Amount Paid*	
Teachers College, New York City	Research relating to the preparation of teachers —Annuity	$10,000.00[60]	
Regents of the University of the State of New York	Study of educational laws of New York	656.26[60]	
Teachers College, New York City	Research relating to the preparation of teachers	10,000.00[61]	
Modern Foreign Language Inquiry	Preliminary Administrative Investigation	3,500.00	1923-24[62]
	Maintenance of Study by American Council on Education, including Canada	19,000.00	1923-24[62]
Society for the Promotion of Engineering Education	Study of Engineering Education	24,000.00	1923-24
		36,000.00	1924-25
		48,000.00	1925-26[62]
Carnegie Foundation for the Advancement of Teaching	Study of Public School Curricula by Department of Superintendence, National Education Association	5,000.00	1924-25[63]

[58]The Director of the Bureau of Educational Research sent a letter to foundations and similar organizations. Some of the preceding and later statements are based upon replies received; consequently, no exact bibliographical reference can be given in several instances.

[59]The twelve organizations are:
1. American Association for Adult Education
2. American Classical League
3. American Council on Education
4. Modern Foreign Language Study
5. American Historical Association
6. Buffalo Educational Council
7. Carnegie Foundation for the Advancement of Teaching
8. Cleveland Conference for Educational Cooperation
9. Institute of Educational Research of Teachers College
10. National Board of Medical Examiners
11. Society for the Promotion of Engineering Education
12. National Society for the Promotion of Industrial Education

[60]Report of 1922, p. 26 and 29, respectively.
[61]Report of 1923, p. 64.
[62]Report of 1924, p. 28.
[63]Report of 1925, p. 35.

Beneficiary	*Name of Appropriation*	*Amount Paid*	
	Study of Examinations in Science by University of the State of New York	$ 5,000.00	1924-25[63]
American Classical League	Examination and Study of Classical Education in the United States	10,000.00	1924-25
		10,000.00	1925-26
		10,000.00	1926-27[63]
National Education Association	Study of business administration of school systems	15,000.00	1925-26[64]
American Historical Association	Investigation of historical study in schools	15,000.00	1927-28[65]
Institute of Educational Research (Teachers College)	Research in theory and practice of measurements of intellect and capacity	20,000.00	1926-27
		20,000.00	1927-28[65]

It is interesting to note that although The Carnegie Corporation of New York made its first annual report for the year ending September 30, 1912, there was no report of expenditures for research until 1916, when $7,000.00 or two-tenths of one per cent of a gross expenditure of $3,433,232.03 for the year was listed as being expended for research of all kinds. During the succeeding years, the proportion of expenditures devoted to research grew rapidly until in 1922 more than 14 per cent of the total was so expended.[66] That such expenditures have been continued or even increased is attested to by the number of organizations given grants recently.

During the earlier part of the ten-year period under consideration, the General Education Board was an important source of aid for educational research, although in the main its resources have been devoted to other kinds of enterprises. The Board is especially well known for its surveys of education in various states; however, the survey of the Gary, Indiana, schools probably attracted the most attention. The report of this survey was published in eight volumes during 1918 and 1919.

Several other foundations, although expending most of their resources along other lines of service, have devoted part of their funds to educational research. Among these should be mentioned: the Carnegie Foundation for the Advancement of Teaching, the Childrens Foundation, the White-Williams Foundation, the Harmon Foundation, the Laura Spelman Rockefeller Memorial, the Phelps-Stokes

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[64]Report of 1926, p. 45.
[65]Report for 1927, p. 27.
[66]These figures were either taken directly from or calculated from data given in: Pritchett, H. S. "The Carnegie Corporation—Report of the Acting President for the Year Ended September 30, 1922." New York: The Carnegie Corporation of New York, 1922, insert between p. 76-77.

Fund, the Cleveland Foundation, the Julliard Musical Foundation, and the Bureau of Educational Experiments.

4. Provisions by federal and state governments. The national government has established two organizations—the United States Bureau of Education and the Federal Board for Vocational Education—which, although not primarily established for this purpose, carry on some educational research.

a. The United States Bureau of Education. In 1923, the statement was made with respect to the Bureau of Education that "the activities involving promotion, advice, and investigation have originated within the last fifteen years, and the history of most of them is brief."[67] Research is one of five non-administrative activities of the Bureau: (1) collecting and disseminating educational information, (2) collecting and disseminating expert opinion on education, (3) advising on educational matters, (4) promoting better educational methods, and (5) carrying on research work.[68] Although some work of a character that is often labeled research has been done in connection with the first four activities, research did not attain a position of prominence in the work of the Bureau until 1919. In that year a plan for establishing research stations in cooperating institutions was consummated, and sixteen such stations were established, only to be abandoned in 1921. However, this attempt is indicative of the role of coordinator that the Federal Bureau assumes with reference to research. As a clearing-house, it serves somewhat indirectly; as organizer of such a committee as the National Committee on Research in Secondary Education, it serves directly.[69] In summarizing the activities of the Federal Bureau, Smith points out that "the trend in policy of the institution [is] away from the historical and biographical toward the more immediate and utilitarian; away from the static functioning as a repository and clearing house to the more dynamic work of promotion and opinion."[70] Taken in connection with his résumé of the activities of the Bureau, this statement carries with it the implication of a growing emphasis on research.

b. Federal Board for Vocational Education. The Federal Board for Vocational Education was established under the Smith-Hughes

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[67]Smith, D. H. "The Bureau of Education—Its History, Activities and Organization." *Institute for Government Research. Service Monographs of the United States Government,* No. 14. Baltimore: The Johns Hopkins Press, 1923, p. 29-30.

[68]*Ibid.,* p. 57.

[69]For fuller accounts, *see:*

Chapman, H. B. "Organized Research in Education," *Ohio State University Studies,* Bureau of Educational Research Monographs, No. 7. Columbus, Ohio: The Ohio State University Press, 1927, p. 135-38.

Smith, *op. cit.,* p. 29-56, 75-77.

[70]Smith, *op. cit.,* p. 77.

Act in 1917, and in 1921 had allotted to it additional duties and responsibilities under the civilian rehabilitation act.

"In the earlier stages of its existence the board was naturally mainly concerned with the establishment of effective machinery for the discharge of its administrative responsibilities. . . . As the administrative situation has become stabilized and as effective working relations have been established, the attention of the board and of its technical staff has been more and more directed to research service."[71]

"In general the policy of the board with regard to research work has been based upon the idea that the board could best assist the States through conducting researches and studies of an experimental character, in order that through such experimental work effective methods could be worked out and placed at the disposal of the States. In many cases these researches have been carried on in cooperation with State officials, and these State officials have always shown themselves very ready to assist the board in its research work in any way that they could."[72]

The research work of the board has been carried on along six lines:[73] (1) development of a technique of job analysis, (2) development of a plan for improving work of employed foreman, (3) securing of special information, (4) working out methods of carrying on civilian vocational rehabilitation, (5) developing ways of securing cooperation between the home-economics school and the home, and (6) development of agricultural teacher-training courses. The board issues bulletins from time to time which embody the results of these research projects.

c. Provisions by state governments. Individual states have done comparatively little by way of providing for educational research. Of the five state bureaus that cooperated with Chapman in his study, only three were highly developed.[74] The five bureaus were located in Connecticut, Georgia, Minnesota, New York, and Wisconsin.[75] Bureaus are also maintained by the state departments of Arkansas, Louisiana, Maryland, Mississippi, and North Carolina.[76]

5. Other provisions. Formal provisions for educational research extend beyond the work of city, university, state, and federal bureaus and the foundations into voluntary organizations of educators and educational institutions. It would be an almost impossible task to name all such organizations that have either been formed for the purpose of conducting or encouraging research or have taken on such responsibilities since being founded. Chief among these organizations may be mentioned the National Society for the Study of Education, the

[71] "Eighth Annual Report to Congress of the Federal Board for Vocational Education." Washington: Government Printing Office, 1924, p. 24.
[72] *Ibid.*, p. 27.
[73] *Ibid.*, p. 24-26.
[74] Chapman, *op. cit.*, p. 212.
[75] *Ibid.*, p. 221.
[76] *Ibid.*, p. 21.

National Society of College Teachers of Education, the Educational Research Association, the American Council on Education, the National Research Council, the Research Department of the National Education Association, the New York Society for the Experimental Study of Education, the World Federation of Educational Associations, and a few state and city research societies, such as those of South Dakota, Minnesota, Los Angeles, and Wilmington, Delaware. By way of illustration, three of these organizations will be described briefly.

a. Research Department of the National Education Association. The Research Department of the National Education Association was organized in March, 1922, as "an agency to carry on emergency research work." It carries on and encourages "investigations of current educational problems." It aims to provide timely data on such problems.[77] The Department publishes information through two channels: the Journal of the National Education Association and Research Bulletins of the Department. The first bulletin was entitled "Facts on the Cost of Public Education and What They Mean." Some of the titles of other bulletins are: "Major Issues in School Finance," "The Problem of Teacher Tenure," "Facts on the Public School Curriculum," and "Teachers' Salaries and Salary Trends in 1923."

b. American Council on Education. The American Council on Education was organized in 1918. However, the preliminary organization and financing of the Council were not developed sufficiently for a Director to take charge until December 1, 1919. The first number of *The Educational Record*[78] was issued in January, 1920. The organization and purposes of the Council are concisely expressed in the following quotation:

> The American Council on Education is the central organization in which the great national educational associations are represented. Its general object is to promote and carry out cooperative action in matters of common interest to the associations and to the institutions composing them. It has three classes of members, constituent, associate and institutional. The constituent members are sixteen national educational associations . . . . Associate members are educational or scientific organizations having interests related to the work of the Council. . . . Institutional members are college, universities, professional and technical schools . . .[79]

The Council was formed primarily as a "unifying agency," aiming "to stimulate discussion, to focus opinion, and in the end to bring about

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[77] Crabtree, J. W. "The New Research Department," *Bulletin of the Research Department of the National Education Association,* No. 1. Washington: National Education Association, June, 1922, p. 2.

[78] This is a quarterly published by the Council.

[79] "American Council on Education," *The Educational Record,* 1:30, January, 1920.

joint action on major matters of higher education."[80] It has found that one of the ways in which it can realize these aims is to foster educational research. Numerous small studies have been initiated. However, the three major studies carried on under the auspices of the Council are the Educational Finance Inquiry, the Modern Foreign Language Study,[81] and a cooperative experiment with psychological examinations for college freshmen. The cooperative experiment with psychological examinations for college freshmen was made possible by a grant from the Commonwealth Fund. The National Research Council Committee on Personnel Research took responsibility for assembling and editing the test material annually, and the American Council on Education cared for the printing and distribution of the test. One hundred nine colleges participated in the study.[82]

c. National Research Council. The National Research Council was established in 1916 by the National Academy of Sciences for the purpose of organizing the scientific resources of the country at a time when international relations were tense. Since the War, the Research Council has been adapted to peace conditions, its essential purpose being "the promotion of scientific research and of the application and dissemination of scientific knowledge for the benefit of the national strength and well-being."[83] The Council is composed of thirteen major divisions, of which a division on educational relations is one. The most ambitious piece of educational research sponsored by the Council has been the development of psychological examinations for college freshmen in cooperation with the American Council on Education.[84] This work has been carried on under the direction of a special Committee on Personnel Research. The Division of Educational Relations has in the main devoted itself to a study of "the problem of the gifted student" and the relations of higher institutions to research.

The research activities of the period.[85] The characterization of this period as one in which quantity production has been attained indicates that the research activities have been numerous. The list of "Reports of Educational Research and Related Materials" published as Chapter II of Part II of this bulletin shows that these activities have been varied with respect to the problems studied. The techniques em-

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[80]"American Council on Education." A pamphlet published by the Council, apparently in 1923 or 1924, p. 1.

[81]*See* p. 71 of this bulletin for a description of the Educational Finance Inquiry. The Modern Foreign Language Study is described on p. 75-77.

[82]Thurstone, L. L. "Psychological Tests for College Freshmen," *Educational Record*, 6:69-83, 282-94, April and October, 1925.

[83]"National Research Council—Organization and Members, 1923-1924." Washington: National Research Council, 1923, p. 7.

[84]Thurstone, *op. cit.*

[85]This description of research activities does not include either educational measurements or curriculum construction. *See* Chapters IV and V.

ployed also have varied. Hence, it is not possible to classify the research activities of the period under certain techniques of topics. The following description is organized under five heads—

1. Major researches
2. Controlled experimentation
3. Inquiries relating to school subjects
4. School surveys
5. Summaries of reports of previous investigations

1. Major researches. Five studies, or rather groups of studies, appear to justify the label "major researches."[86b] By limiting the list to five, the writers do not mean to imply that there have not been other investigations of high importance during this period. The limitations of space preclude an extended list, and by virtue of their importance and the high quality of research technique employed these five seem to stand out sufficiently clearly to justify the title, "major researches." The following descriptions are confined to an indication of the problems studied, the techniques employed, and the extensiveness of the investigation. No attempt has been made to summarize or evaluate the findings. The fact that such extensive studies have been possible is itself significant. It is convincing evidence of one aspect of the status of educational research.

a. The Chicago reading studies.[86a] Judd and his colleagues at the University of Chicago have extended the studies of reading described on page 43. The new series of studies includes the following:

BUSWELL, G. T. "An Experimental Study of the Eye-Voice Span in Reading," *Supplementary Educational Monographs,* No. 17. Chicago: The University of Chicago, 1920. 105 p.

TERRY, P. W. "How Numerals are Read," *Supplementary Educational Monographs,* No. 18. Chicago: The University of Chicago, 1922. 109 p.

BUSWELL, G. T. "Fundamental Reading Habits: A Study of Their Development," *Supplementary Educational Monographs,* No. 21. Chicago: The University of Chicago, 1922. 150 p.

GRAY, W. S. "Remedial Cases in Reading: Their Diagnosis and Treatment," *Supplementary Educational Monographs,* No. 22. Chicago: The University of Chicago, 1922. 208 p.

JUDD, C. H., and BUSWELL, G. T. "Silent Reading: A Study of the Various Types," *Supplementary Educational Monographs,* No. 23. Chicago: The University of Chicago, 1922. 160 p.

[86b] These five major researches are as follows:
a. The Chicago reading studies
b. The Educational Finance Inquiry
c. The Thorndike study of the measurement of intelligence
d. Genetic Studies of Genius
e. Studies of nature and nurture

[86a] These studies are included here rather than later under "Inquiries Relating to School Subjects" because they have dealt with the mental and physical processes of reading rather than with its status as a school subject.

GRAY, W. S. "Summary of Investigations Relating to Reading," *Supplementary Educational Monographs,* No. 28. Chicago: The University of Chicago, 1925. 275 p.[86b]

With the exception of the last one, whose title indicates its general character, these studies were made in the reading laboratory at Chicago.[87] As in the case of the earlier studies, the dominant characteristic was the use of a specially devised apparatus for photographing the eye-movements of readers. In the study of the eye-voice span this apparatus was supplemented by a dictaphone for securing a record of oral reading. These mechanical devices for securing data were supplemented by other means in two of the studies. Terry employed introspection in one phase of his study of the reading of numerals. In the study of diagnosis and remedial instruction, Gray employed various methods of diagnosis of which the photographing of eye-movements was one. In the studies reported in monographs 17, 21 and 23, several subjects were selected from the high-school and college levels. This is significant because the earlier studies were confined largely to subjects from the elementary school, principally the lower grades. Another significant feature of the last one of this group is an inquiry into the reading of foreign languages. In the last study listed, Gray reported an organized summary and annotated bibliography of 436 published reports of reading investigations. These extended over the period from 1884 to July, 1924.

b. The Educational Finance Inquiry. This investigation, begun in 1921, was in charge of a commission under the auspices of the American Council on Education. The Headquarters Staff consisted of the following: George D. Strayer, Director; Robert Murray Haig, Associate Director; Carter Alexander, Assistant Director; Howard G. Burdge, Assistant Director for the State of New York; Mabel Newcomer, Economist; Mabelle M. Campbell, Secretary to the Commission.

The Educational Finance Inquiry is probably the most extensive piece of educational research ever undertaken. A total of $200,000 was appropriated for the Inquiry by the Commonwealth Fund, the General Education Board, the Carnegie Corporation, and the Milbank Memorial Fund. The report was published in the following thirteen volumes:

ALEXANDER, CARTER. *Bibliography on Educational Finance,* Volume IV. New York: The Macmillan Company, 1924. 257 p.

[86b]The last four of these studies were made possible by appropriations from the Commonwealth Fund.

[87]A partial exception should be made in the case of No. 22 in which some minor studies carried on in the public schools of Toledo, Ohio, are reported.

HENRY, N. B. *A Study of Public School Costs in Illinois Cities,* Volume XII. New York: The Macmillan Company, 1924. 82 p.

HUNT, C. W. *The Cost and Support of Secondary Schools in the State of New York,* Volume III. New York: The Macmillan Company, 1924. 107 p.

MCGAUGHY, J. R. *The Fiscal Administration of City School Systems,* Volume V. New York: The Macmillan Company, 1924. 95 p.

MORRISON, H. C. *The Financing of Public Schools in the State of Illinois,* Volume IX. New York: The Macmillan Company, 1924. 162 p.

NEWCOMER, MABEL. *Financial Statistics of Public Education in the United States, 1910-1920,* Volume VI. New York: The Macmillan Company, 1924. 188 p.

REEVES, F. W. *The Political Unit of Public School Finance in Illinois,* Volume X. New York: The Macmillan Company, 1924. 166 p.

RUSSELL, W. F., *et al. The Financing of Education in Iowa,* Volume VIII. New York: The Macmillan Company, 1925. 279 p.

SEARS, J. B., and CUBBERLEY, E. P. *The Cost of Education in California,* Volume VII. New York: The Macmillan Company, 1924. 353 p.

STEVENS, E. B., and ELLIOTT, E. C. *Unit Costs of Higher Education,* Volume XIII. New York: The Macmillan Company, 1925. 212 p.

STOOPS, R. O. *Elementary School Costs in the State of New York,* Volume II. New York: The Macmillan Company, 1924. 123 p.

STRAYER, G. D., and HAIG, R. M. *The Financing of Education in the State of New York.* New York: The Macmillan Company, 1923. 205 p.

WILLETT, G. W. *The Public School Debt in Illinois,* Volume XI. New York: The Macmillan Company, 1924. 97 p.

c. The Thorndike study of the measurement of intelligence. During a period of three years beginning July 1, 1922, E. L. Thorndike and his co-workers in the Division of Psychology of the Institute of Educational Research carried on an investigation of the "nature and meaning of the measurement of a mental fact in the sample case of intelligence, or rather a defined segment thereof." The study is reported in a volume of 616 pages.[88] Its scope is indicated by the following list of chapter titles:

The Present Status
The Measurement of Difficulty
The Measurement of the Intellectual Difficulty of Tasks and of Level of Intellect: More Rigorous and Exact Methods
The Measurement of the Intellectual Difficulty of a single Brief Task
The Measurement of the Intellectual Difficulty of Tasks by a Consensus of Expert Opinion
Levels of Intellect
The Transformation of the Scores of Standard Intelligence Examinations into Terms of Scales with Equal Units
The Form of Distribution of Intellect in Man
A Scale for Measuring Altitude of Intellect
The Absolute Zero of Intellectual Difficulty
The Measurement of the Altitude of an Individual Intellect
The Measurement of Width and Area of Intellect
The Relations of Altitude to Width, Area, and Speed

[88]Thorndike, E. L., *et al. The Measurement of Intelligence.* New York: Bureau of Publications, Teachers College, Columbia University, 1927. 616 p.

The Meaning of Scores Obtained in Standard Intelligence Examinations
The Nature of Intellect
The Measurement of Original Intellectual Capacity and of Acquired Intellectual Ability
Changes in the Altitude and Area of Intellect With Age
Summary of Results and Applications to the Measurement of Human Abilities in General

d. Genetic Studies of Genius. The group of researches known as "Genetic Studies of Genius" were begun in 1921 at Stanford University under the direction of Lewis M. Terman. The purpose and scope of the investigation are indicated by the following statements:

> The purpose of the present investigation has been, therefore, to determine in what respects the typical gifted child differs from the typical child of normal mentality. Data have been collected on more than 1,400 children, each of whom ranks well within the top one per cent of the unselected school population of corresponding age. The greater part of this report, however, is devoted to 643 such children, who constitute a typical group for whom the data at hand are most extensive. Less extensive material is reported for a second group of 309 subjects (Chapter XIX), making a total, in round numbers, of nearly 1,000 gifted subjects for whom data have been analyzed. On many points control data have been secured for 600 to 800 unselected children. The plan of the investigation called for the collection of about 65 pages of test and measurement data and about 35 pages of questionnaire data, a total of approximately 100 pages for each child. Practically all of this material was obtained for more than 90 per cent of the main experimental group of 643 subjects, and about half of it for nearly 600 other gifted subjects. In addition, a large part of the material was also obtained for several hundred unselected children.[89]

Merely locating "1,400 children, each of whom ranks well within the top one per cent of the unselected school population of corresponding age," was a gigantic task. Something of the magnitude of the investigation is indicated by the fact that after these children were located 100 pages of data were collected for each child and the total mass of information was analyzed, summarized, and interpreted. The group of studies was financed by appropriations from the Commonwealth Fund and the Thomas Welton Stanford Fund. The report has been published in two volumes:

TERMAN, L. M., *et al. Genetic Studies of Genius,* Vol. I. *Mental and Physical Traits of a Thousand Gifted Children.* Stanford University: Stanford University Press, 1925. 648 p.

COX, C. M., *et al. Genetic Studies of Genius,* Vol. II. *The Early Mental Traits of Three Hundred Geniuses.* Stanford University: Stanford University Press, 1926. 842 p.

Two supplementary studies have been published separately:

TERMAN, L. M. and LIMA, MARGARET. *Children's Reading: A Guide for Parents and Teachers.* New York: D. Appleton and Company, 1925.

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[89]Terman, L. M., *et al. Genetic Studies of Genius,* Vol. I. Stanford University: Stanford University Press, 1925, p. viii-ix.

RAUBENHEIMER, A. S. "An Experimental Study of Some of the Behavior Traits of the Potentially Delinquent Boy," *Psychological Monographs,* Vol. 34, No. 6. Princeton, New Jersey: Psychological Review Company, 1925. 107 p.

e. Studies of nature and nurture. A group of studies relating to the "possibilities and limitations of training" made under the direction of a committee of the National Society for the Study of Education have been published as The Twenty-Seventh Yearbook, Part I and Part II[89a] of that society. Twenty-one names are listed as authors and the several reports total 813 pages. A small portion of the expense of the group of studies was borne by the National Society for the Study of Education. "Four of the major contributions—the Chicago and Stanford investigations of foster children, the Hollingworth-Cobb investigation, and the Heilman investigation—have been facilitated by grants from the Commonwealth Fund, from Mr. Max Rosenburg, from Stanford University, from the Institute of Educational Research of Teachers College, from the Carnegie Corporation of New York, from the Colorado State Teachers College, and from the Denver Public Schools." Many other organizations and institutions contributed, usually indirectly "through permitting their representatives to devote their time and energy to the gathering of data and preparation of contributions." The total cost of the studies has been estimated by Lewis M. Terman, chairman of the committee, to be in excess of $100,000.

2. Controlled experimentation. Experimentation, especially under classroom conditions, was necessarily limited until after the development of adequate achievement tests. Furthermore, refined experimentation requires the measurement of general intelligence or capacity to learn. When convenient group intelligence tests became available about 1920, the way was open for experimentation and this type of educational research quickly became popular. The idea of experimentation is a very attractive one. Theoretically this type of educational research affords a means of answering all questions concerning the merits of educational procedures and materials. Under the heading, "Experimental selection of methods and materials of study, instruction and supervision," McCall wrote in 1922:

> Everything that touches a pupil shows whether it is gold. Teacher, supervisor, principal, superintendent, United States Commissioner of Education, materials, methods, normal schools, this book, educational tests, the educational philosopher who confines himself solely to a contemplation of the ultimate, all these show whether they are gold or dross by the efficiency they show in altering the synaptic connections of this pupil's neurones. If no one of

[89a]Terman, L. M., *et al.* "Nature and Nurture," *Twenty-Seventh Yearbook of the National Society for the Study of Education,* Parts I, II. Bloomington, Illinois: Public School Publishing Company, 1928. 465, 397 p.

the above produces any desirable change in the pupil they are educationally without worth.[90]

In the first chapter of *How to Experiment in Education*, published in 1923, McCall wrote:

"Everywhere there are evidences of an increasing tendency to evaluate educational procedures experimentally."

Although McCall probably should be classified as an experimentation enthusiast, his statements are indicative of the widespread interest in this type of educational research. A number of extensive experimental investigations have been undertaken. For example, in the autumn of 1920 the Bureau of Educational Research at the University of Illinois began three experiments[91] in the schools of Chicago, one of which involved about 8,000 children and extended over a period of two years. Collings[92] has reported an experiment that extended over a period of four years.

3. Inquiries relating to school subjects. There have been three outstanding inquiries relating to school subjects: the investigation by the National Committee on Mathematical Requirements of The Mathematical Association of America, begun in 1916 and reported in 1923;[93] the Classical Investigation conducted by the Advisory Committee of the American Classical League, begun in 1920 and reported in 1924-25;[94] and the Modern Foreign Language Study under the auspices of the American Council on Education, with the cooperation of the Canadian Committee on Modern Languages and the United States Bureau of Education, begun in 1924 and still in progress.[95] The History Inquiry,

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[90]McCall, W. A. *How to Measure in Education.* New York: The Macmillan Company, 1923, p. 156.

[91]"Relation of Size of Class to School Efficiency," *University of Illinois Bulletin,* Vol. 19, No. 45, Bureau of Educational Research Bulletin No. 10. Urbana: University of Illinois, 1922. 39 p.

Monroe, W. S. "Relation of Sectioning a Class to the Effectiveness of Instruction," *University of Illinois Bulletin,* Vol. 20, No. 11, Bureau of Educational Research Bulletin No. 11. Urbana: University of Illinois, 1922. 18 p.

Odell, C. W. "The Use of Intelligence Tests as a Basis of School Organization and Instruction," *University of Illinois Bulletin,* Vol. 20, No. 17, Bureau of Educational Research Bulletin No. 12. Urbana: University of Illinois, 1922. 78 p.

[92]Collings, Ellsworth. *An Experiment with a Project Curriculum.* New York: The Macmillan Company, 1923. 346 p.

[93]"The Reorganization of Mathematics in Secondary Education," The Mathematical Association of America, Inc., 1923. 652 p.

[94]"The Classical Investigation"; Part I, General Report; Part III, The Classics in England, France, and Germany. Princeton, New Jersey: Princeton University Press, 1924, 305 p.; 1925, 204 p.

[95]In addition to shorter bulletins and mimeographed statements, the following publications have either been issued or are in press:

Wood, B. D. "New York Experiments with New-Type Modern Language Tests," *Publications of the American and Canadian Committees on Modern Languages,* Vol. 1. New York: The Macmillan Company, 1927. 339 p.

Buswell, G. T. "A Laboratory Study of the Reading of Modern Foreign Languages," *Publications of the American and Canadian Committees on Modern Languages,* Vol. 2. New York: The Macmillan Company, 1927. 100 p.

Wylie, A. T. "Enrollment in Modern Foreign Languages in Secondary Schools and Colleges in the United States," *Publications of the American and Canadian Committees on Modern Languages,* Vol. —. New York: The Macmillan Company, 192—. — p.

carried on during the period from October 1, 1923, to April 1, 1924, by a committee of the American Historical Association,[96] is one of a number of minor inquiries.

Each of the three major investigations, being national in scope and generously financed,[97] involved the cooperation of a large number of persons and data were collected on an extensive scale. In the Mathematical Investigation, approximately four hundred coefficients of correlation and correlation ratios of school marks were computed for graduates of six high schools (from 200 to 700 pupils per school), experimental studies were carried on in fifteen high schools, and questionnaire returns were secured from 2083 college students, approximately eight thousand high-school students, and 155 business and professional men. The Classical Investigation secured the cooperation of "the principals and Latin teachers of over 10,000 secondary schools, the registrars or other officials of practically every college in the country, all the state superintendents of public instruction and many other persons." Among the "many other persons" were "forty-eight leading professors of education and psychology," many graduate students who prepared masters' and doctors' theses as part of the investigation, and thousands of high-school and college students and graduates. As an outgrowth of this investigation, Henmon prepared his "A French Word Book Based on a Count of 400,000 Running Words."[98] The extensiveness of The Modern Language Study is indicated by the following facts relative to the Wood and Buswell investigations: Wood made three studies; the first involved "all students of French and Spanish in the junior high schools of New York City . . . . in June, 1925";[99] the second involved all pupils taking the French, Spanish, German, and Physics examinations of the Regents of the State of New York in June, 1925: 31,025 pupils; the third study was a second survey similar to the first. Buswell made an intensive study of eye-movements in reading foreign languages; "altogether, 192 different subjects were used in the investigation, . . . 601 different photographs were taken,"

Buchanan, M. A. (Compiled by). "A Graded Spanish Word Book," *Publications of the American and Canadian Committees on Modern Languages,* Vol. —. Toronto, Canada: The University of Toronto Press, 192—. — p.

"Report of Progress on the Modern Foreign Language Study," Submitted by the Executive Committee and Special Investigators to the Committee on Direction and Control at its Meeting in Chicago, Illinois, December 31, 1925, to January 2, 1926. 44 p. (Mimeographed and bound.)

[96]Dawson, Edgar. "The History Inquiry," *Historical Outlook,* 15:239-72, June, 1924.

[97]All four investigations received grants of money or technical assistance from foundations or similar organizations: the Mathematical Investigation from the General Education Board of New York City; the Classical Investigation from the General Education Board; the Modern Language Study from the Carnegie Corporation of New York; and the History Inquiry from the Institute of Educational Research of Teachers College, Columbia University.

[98]Henmon, V. A. C. "A French Word Book Based on a Count of 400,000 Running Words," *University of Wisconsin, Bureau of Educational Research Bulletin,* No. 3. Madison: University of Wisconsin, 1924. 84 p.

[99]The number was approximately 50,000.

and 2,040 paragraphs were read by the subjects, who were elementary-school, high-school, and college students, and expert adult readers of the languages studied: English, French, German, Spanish, Latin. Six thousand six hundred feet of kinetoscope film were used.

4. School surveys. The school survey movement, which had reached approximately its present form by 1918, has lost none of its vigor since that date. Certain new features and tendencies have appeared, however, within the past ten years. Probably the most important have been the use of intelligence tests as well as tests of achievement and the development of a group of "professional surveyors." This latter development is indicated by the establishment of the Division of Field Studies of the Institute of Educational Research at Teachers College in 1922. Under the direction of G. D. Strayer, this division has conducted about twenty-five city school surveys and similar studies. Another tendency has been the replacement of the formal survey, made chiefly by outside experts, by the so-called "continuous survey," made entirely or mostly under the direction of local school officials. In this type of survey, certain phases of the school system are studied one year, other aspects the next year, and so on, so that once within a period of years each important phase is rather thoroughly and critically studied. In other words, although at first surveys were usually thought of as something outside of the regular routine of administration and supervision, in many cases being made to justify a superintendent or school board or to settle certain questions at issue, they have been incorporated into the regular routine of many school systems.

Nevertheless, there is still a legitimate place for formal surveys by outside experts. Many such surveys have been made, although none appear to be as distinctive as some of those prior to 1918. The most elaborate ones have been state-wide rather than confined to a single city as were the New York Survey in 1911-12 and the Gary Survey in 1916. Among the more important state-wide surveys were those of the Virginia schools,[100] of Mississippi,[101] and of the rural schools of New York State.[102]

5. Summaries of reports of previous investigators. The summary for reading by Gray[103] and the one for arithmetic by Buswell and

[100]Inglis, A. J. (Director). *Virginia Public Schools.* Yonkers: World Book Company, 1920-21. Parts I and II.

[101]O'Shea, M. V. *Public Education in Mississippi.*
O'Shea, M. V. *A State Educational System at Work.* 1927. 368 p.

[102]Works, G. A., *et al. Rural School Survey of New York State.* Ithaca, New York: Joint Committee on Rural Schools, 1922-23. 8 volumes.

[103]Gray, W. S. "Summary of Investigations Relating to Reading," *Supplementary Educational Monographs,* No. 28. Chicago: University of Chicago, 1925. 275 p. Supplemented in the *Elementary School Journal,* 26:449-59, 507-18, 574-84, 662-73; 27:456-66, 495-510; 28: 443-59, 587-602.

Judd[104] are probably the most ambitious attempts to bring together in an organized form the results of studies within given fields, but educational writings of the past ten years include a number of other summaries.[105] The development of the interest in summarizing reports of researches within given fields is probably indicated roughly by the number of bibliographies published. Table III gives the frequencies by years of those included in "A Bibliography of Bibliographies."[106] Although this compilation includes bibliographies from 1900 to 1926, nearly half of them bear the date of 1923 or later. The need for compiling bibliographies is much greater than formerly, but the development of an interest in summarizing reports of previous investigations is a characteristic of the educational research of the period 1918-27.

The accomplishments. In attempting an appraisal of educational research during the period 1918-27 it is necessary to bear in mind that there have been many types of investigations. Experimentation and other studies involving the administration of educational tests are probably most numerous, but educational research also includes studies of educational history, school finance, buildings and equipment, training and experience of teachers, eye-movements of readers, social composition of the school population, and the like. It is also necessary to keep in mind the distinction between collecting descriptive facts and determining principles or rules specifying what should be.

It is obvious that during this period from 1918 to 1927 an enormous mass of descriptive data has been collected and, in many cases,

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[104]Buswell, G. T. and Judd, C. H. "Summary of Educational Investigations Relating to Arithmetic," *Supplementary Educational Monographs,* No. 27. Chicago: University of Chicago, 1925. 212 p. Supplemented in the *Elementary School Journal,* 26:692-703, 745-58; 27:685-94, 731-44; 28:702-9.

[105]The following are some of the more important ones:

Alexander, Carter. "Research in Educational Publicity," *Teachers College Record,* 29:479-487, March, 1928.

Brown, J. C. "A Summary of Some Significant Conclusions Reached by Investigators Relative to Arithmetic," *Elementary School Journal,* 25:346-57, January, 1925.

Good, C. V. "The Literature on College Teaching," *School and Society,* 27:481-487, April 21, 1928.

Gunthorp, Horace, and Mudge, E. L. "The Research Contribution of the Smaller Colleges," *School and Society,* 11:656-60, May 29, 1920.

Kepner, P. T. "A Survey of the Test Movement in History," *Journal of Educational Research,* 7:309-25, April, 1923.

Lane, M. R. "Some Recent Researches in Guidance," *School and Society,* 20:268-72, August 30, 1924.

Strayer, G. D. "The Scientific Approach to the Problems of Educational Administration," *School and Society,* 24:685-95, December 4, 1926.

Symonds, P. M. "Methods of Investigation of Study Habits," *School and Society,* 24:145-52, July 31, 1926.

Theisen, W. W. "Recent Progress in Educational Research," *Journal of Educational Research,* 8:301-14, November, 1923.

Trabue, M. R. "Educational Research in 1925," *Journal of Educational Research,* 13:336-44, May, 1926.

Woodring, M. N. and Flemming, C. W. "A Survey of Investigations on Study," *Teachers College Record,* 29:527-549; 605-617, March and April, 1928.

Woody, Clifford. "A Survey of Educational Research in 1923," *Journal of Educational Research,* 9:357-81, May, 1924.

[106]Monroe, W. S. and Asher, Ollie. "A Bibliography of Bibliographies," *University of Illinois Bulletin,* Vol. 24, No. 44, Bureau of Educational Research Bulletin No. 36. Urbana: University of Illinois, 1927. 60 p.

TABLE III
FREQUENCIES BY YEARS OF BIBLIOGRAPHIES IN "A BIBLIOGRAPHY OF BIBLIOGRAPHIES"

Year	Frequency	Year	Frequency
1900	1	1915	3
1901		1916	6
1902	1	1917	9
1903		1918	7
1904		1919	13
1905		1920	9
1906		1921	19
1907	3	1922	7
1908	3	1923	28
1909	2	1924	34
1910	3	1925	34
1911	3	1926	18
1912	4		
1913	11		
1914	14	Total	232

summarized and published. The collections include such items as chronological ages of children, test scores, school marks, interests of children, enrollment data, size of classes, expenditures, tax rates, eye-movements of various types of readers, words appearing in children's writings, training and experience of teachers, duties of teachers, legal status of the superintendent, social composition of boards of education, duties of janitors, types of school equipment, arithmetical problems encountered by adults, and topics appearing in the *Literary Digest*. As a basis for a general appraisal, it may be noted that many of the items of information collected are inaccurate or faulty in other respects, and in most cases the collections are fragmentary. Consequently, the total accumulation of data must be heavily discounted when their usefulness is considered. For example, the tabulations of scores obtained by a state-wide administration of a silent reading test have a very limited usefulness. The scores from the several schools probably involve constant errors, and the organization of the school systems and the instruction vary widely. Since these factors are unknown, any interpretation of the data collected must be qualified. The permanent value of the information is even less.

In order to obtain an index of contributions in the form of principles or rules, the volumes of the *Journal of Educational Research* from January, 1920, to June, 1927, were analyzed. The total number of articles was 467. Of this number, 72, or approximately 15 per cent, appear to qualify as experimental investigations in which an attempt was made to evaluate a method of teaching or some other procedure relative to instruction. Thirty-five of these studies or slightly less than

half, were controlled experiments. Only seven were definitely built upon previous investigations and in only seventeen others was any comparison made with the results of previous investigations. Thus, forty-eight, or two-thirds of the total number, may be considered relatively isolated studies. If the conclusions reached in the experimental studies reported in the *Journal of Educational Research* are accepted at face value, what contributions do they make? The answer to this question may be indicated by giving a few typical conclusions:

1. Success in reading came to all problem cases "through careful, thoughtful diagnosis, and an application of such remedial measures as seemed likely to meet each child's difficulty."[107]

2. Improvement in comprehension in reading will result from drill, the children of lesser ability profiting most.[108]

3. Among the conclusions of one study it is stated that concentrated attention on drill in arithmetic resulted in increased skill no matter what method was used, but the teacher was found to be a factor.[109]

4. The inability of children to hold their attention to the task of adding a long column may be remedied by requesting them to divide the column into two parts and add them separately.[110]

5. The lecture-demonstration method is superior for bright students.[111]

6. "The chief conclusion to be drawn . . . is that there is no advantage in having children write their spelling words in sentences."[112]

7. In another investigation the conclusion is reached that "grouping words of similar difficulty together in spelling is a significant factor, and that grouping of words for study secures approximately 10 per cent better results than a study of words in a chance order."[113]

8. Note-takers show marked superiority in quiz results except when a true-false examination is given immediately following the lecture. Note-takers have greater organization and retention.[114]

9. "Knowledge that there may be a final examination will produce worthwhile results."[115]

When all of the conclusions are brought together the result is disappointing. Some of them approach being platitudinous; others deal with relatively unimportant details of instructional procedure. As already pointed out, most of the studies have no connection with other investigations.

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[107]Geiger, Ruth. "A Study in Reading Diagnosis," *Journal of Educational Research,* 8:283-300, November, 1923.

[108]Alderman, G. H. "Improving Comprehension Ability in Silent Reading," *Journal of Educational Research,* 13:11-21, January, 1926.

[109]Kelly, F. J. "The Results of Three Types of Drill on the Fundamentals of Arithmetic," *Journal of Educational Research,* 2:693-700, November, 1920.

[110]Ballenger, H. L. "Overcoming Some Addition Difficulties," *Journal of Educational Research,* 13:111-17, February, 1926.

[111]Anibel, F. G. "Comparative Effectiveness of the Lecture-Demonstration and Individual-Laboratory Method," *Journal of Educational Research,* 13:355-66, May, 1926.

[112]Hawley, W. E. and Gallup, Jackson. "The 'List' Versus the 'Sentence' Method of Teaching Spelling," *Journal of Educational Research,* 5:306-10, April, 1922.

[113]Tidyman, W. F. and Johnson, Edith. "Value of Grouping Words According to Similar Difficulties in Spelling," *Journal of Educational Research,* 10:297-301, November, 1924.

[114]Crawford, C. C. "Some Experimental Studies of the Results of College Note-taking," *Journal of Educational Research,* 12:379-86, December, 1925.

[115]Schutte, T. H. "Is There Value in the Final Examination?" *Journal of Educational Research,* 12:204-13, October, 1925.

If we examine critically the research techniques employed by the various investigators, it becomes apparent that most of the conclusions must be discounted. The seventy-two reports of experiments were classified under three heads: (1) research technique satisfactory, or open only to minor criticisms; (2) research technique reasonably satisfactory but generalization not justified; (3) research technique open to such serious criticism that the conclusion is not dependable. Only five out of the seventy-two articles were placed in the first group; twenty were assigned to the second; and forty-seven, nearly two-thirds, were listed as being open to such serious criticism that the conclusion could not be accepted as dependable.

One of the chief reasons for assigning studies to the last group was the abnormality of the experimental conditions. In several instances, the improvement in achievement noted appeared to have been due to the enthusiasm of the teacher for the procedure rather than to any inherent worth. The fact that a procedure is new frequently results in unusual enthusiasm on the part of the teacher which is communicated to the pupils. In fact, the pupils themselves are likely to be stimulated directly by a procedure that lifts their work out of the usual deadly routine. Another reason for classifying nearly two-thirds of these experimental studies as being essentially worthless is the frequent failure of the investigator to give proper attention to faults in his data.

A somewhat extreme illustration of abnormal experimental conditions is furnished by an investigation designed to discover the value of final examinations.[116] In describing the experimental procedure, the writer says: "The examination group was told once or twice a week that the material should be mastered, since it might be called for in the final test. On the same days, the other group was cautioned to do the work thoroughly from day to day .... because no final examination would be given." This procedure is hardly that of normal classroom teaching, and doubtless the effect was to accentuate the differences on which the conclusions were based. However, a more glaring evidence of abnormality is apparent when the reader is told: "at the close of the two periods of experiment the groups not expecting a final test were given the same one that the other sections were given," and also that the students were given "their choice as to whether the score made on the final examination should be considered in making up their term marks." Such techniques probably affected the scores of the non-examination group.

[116] Schutte, *op. cit.*

An illustration of failure to give attention to faults in the data is furnished by an investigation in which the probable errors due to sampling were not calculated. On the basis of a difference of 4.4 between the average gains of the two groups, the following conclusion was stated: "Our results seem to indicate that carefully directed study or work of children in writing compositions is decidedly valuable to children receiving such supervision."[117] However, this conclusion was not allowed to go unchallenged. Four months later, there appeared in the same journal a criticism of the investigation in which it was shown that the conclusion could not be accepted when the results were interpreted in light of the probable error of the difference between the means. The chances of the true value of one mean being greater than the true value of the other mean were only 5 to 1. To quote the words of the critic: "These are hardly safe betting odds on which to base scientific conclusions."[118]

This appraisal of the reports of experimental studies which have appeared in the *Journal of Educational Research* is subjective, and another person would doubtless make some changes in the classification. However, the conditions discovered are indicative of the extent to which it is necessary to discount the conclusions that experimenters announce. On the whole, it appears justifiable to state that very meagre contributions have been made by this group of experimental investigations.

It should be borne in mind, however, that most of the experimental studies reported in educational journals are minor investigations. As an index of contributions in the form of principles or rules, they need to be supplemented by an evaluation of larger studies, such as those made by candidates for the Ph. D. degree.

Practically all of the Teachers College Contributions to Education have been accepted in partial fulfillment of the requirements for the degree of doctor of philosophy. During the period from 1918 to 1926 inclusive, 141 volumes were published, of which 26 qualify as reports of experimental investigations. Seventeen of these experiments were controlled and 18 were definitely built upon the work of previous investigators. In only 5 cases there was no comparison with previous investigations. These facts indicate that the experiments reported from Teachers College are distinctly superior to those reported in the *Journal of Educational Research*. This conclusion is reinforced by an

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[117]Heckert, J. W. "The Effects of Supervised Study in English Composition," *Journal of Educational Research*, 5:368-80, May, 1922.

[118]Holzinger, K. J. "Inferences from Small Samples and Differences," *Journal of Educational Research*, 6:175-76, September, 1922.

examination of the several reports. An attempt to classify the 26 contributions resulted in 5, or nearly 20 per cent, being listed as distinctly satisfactory with respect to technique, and only 11 being listed as not yielding dependable conclusions.

A critical examination of some of the more careful experiments of the period reveals the general character of the limitations to which the results of this type of educational research are subject. For example, in an experiment with a project curriculum,[119] which extended over a period of four years, Collings provided a control group and supplemented the measurement of achievement by means of a large battery of standardized tests by collecting evidence of changes in attitudes toward the school and education and of changes in the community life. On the whole, the plan of the experiment and the techniques employed are distinctly superior to those of most experimental investigations, and the differences between the experimental school and the control group are so large that no reasonable allowance for error in the measurements would reverse the findings. A critical examination of the report of this experiment indicates, however, that the data should not be interpreted as proving the superiority of the project method in general. As Collings points out,[120] there were a number of variable factors which might account for the differences in outcomes in the two groups. In other words, Collings demonstrated the superiority of the school using a project curriculum under the conditions of the experiment, but it appears doubtful whether he demonstrated the superiority of a project curriculum in general.

In commenting upon the controlled experiment as a method of educational research, Morrison has pointed out a limitation due to the complexity of the problems we would like to solve.

> It is exceedingly difficult to raise an issue in the teaching process which is sufficiently definite. Most issues are apt to be deceptive as to complexity. Thinking that we have a perfectly simple issue, we carry on the experiment, over a period of months it may be, and in the end the findings are disappointing. Other investigators find disparate results with the same procedure. What seemed simple may well have been complex. For instance, the following problem: A comparison of the direct and grammatical methods of teaching first-year French. The result of experimentation under the control-group plan on any such issue could hardly fail to be inconclusive and unconvincing, whatever the outcome. The terms, apparently simple, are actually complex and undefined. There is no defended assumption as to the test to be used as the criterion. If the problem were stated as follows, some light might be shed: Assuming that the objective in first-year French is maximum ability to react to the meaning (defined) of French discourse, as measured by such and such test, will a given direct method (defined and procedure defined) prove more economical than a given gram-

[119] Collings, Ellsworth. *An Experiment with a Project Curriculum.* New York: The Macmillan Company, 1923. 346 p.
[120] *Ibid.*, p. 13f.

matical method (defined and procedure defined)? Obviously, an issue thus hedged in can have only the most limited application. Hence the adaptability of the method for settling minor details in broader forms of investigation.[121]

Although no systematic survey has been made, it appears that the permanent accomplishments of educational research during this period are much less than the quantity of production would lead one to expect. This is especially true of experimental studies. Valuable facts have been collected and assembled in usable form, but there has been relatively little progress in evaluating school procedures.

In addition to the accomplishments that can be listed as facts or principles, there are less tangible gains that may be designated as attitudes. For example, under the caption "The Chief Contributions of the Inquiry," Carter Alexander, Assistant Director of the Educational Finance Inquiry, has written as follows:

> The greatest good from the Inquiry, in the writer's judgment, will not be immediate. Nor will it consist only of things on which one can put a finger. This is written despite the facts that the list of such specifically valuable things is lengthy and that practically all states will soon have various similar studies, now that the pioneer work on the methods of study is available. This good lies rather in certain somewhat intangible and deferred values such as changed points of view of both educators and laymen and in the training of school administrators.
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> The volumes "will undoubtedly stimulate a wholesome type of thinking about school finance which has never been possible before because the factual basis has not been at hand in any such comprehensive body of material. There will probably follow a series of discussions in the public press as well as in the technical journals." [*School Review,* Editorial, March, 1924, p. 162.] As a result educators and teachers generally will acquire a better understanding of the complexity of the problems involved in financing education, a keener sympathy with the taxpayer, and a surer realization that many of the difficulties of educational finance arise from the need of general tax reform which cannot possibly be secured for some time.[122]

The status of educational research. Certain aspects of the present status of educational research have been noted in the preceding pages. Quantity production has been attained; research in education has become popularized; there is a widespread faith in objective methods; the facilities for educational research have been greatly expanded. In order to complete the picture, the quality of current educational research must be considered. Critical observers have called attention to numerous shortcomings. The following quotations from recent writings lose something of their forcefulness by being removed from their context, but they are representative of evaluations by recent writers.[123]

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[121]Morrison, H. C. "The Major Lines of Experimentation in the Laboratory Schools," *Supplementary Educational Monographs,* No. 24. Chicago: University of Chicago, 1923, p. 5.

[122]Alexander, Carter. "The Work of the Educational Finance Inquiry," *Teachers College Record,* 25:219-20, May, 1924.

[123]*See also* p. 25-26.

"We have observed in many of the practices of educational research workers a tendency to shallowness. We have taken occasion to point out more than once a lack of sustained effort, a willingness to flit from one thing to another, and an unwillingness to stay with a problem until fundamental—the word seems to haunt us—until fundamental results are secured. . . . We are threatened with becoming mere dabblers in research, foolishly confident of the virtues of a fresh start."[124]

"We must use greater care to make certain that the conclusions we state in our reports follow logically from the data presented. Too many reports state conclusions that are not fully supported by the research data included in them. This association should interest itself in the quality as well as in the quantity of educational research."[125]

"If I may borrow a descriptive phrase from the game of golf, many would-be educational scientists 'do not follow through.' By the time their observations and records have been made, some more attractive activity is sighted in the distance, and they hurry off in pursuit of it. A sufficient number of standard tests have been administered in the past ten years to have solved more than half of the instructional problems of which we have any knowledge, if only the right tests had been given at the right time and the scores used as the basis for reflective reasoning of the type required in the scientific method."[126]

"Nevertheless, I can not evade the conviction that, relatively speaking, the published research in education is, on the whole, inferior in quality, and more especially inferior in ultimate significance, to the published research in other branches of scientific endeavor. Too many contributions seem essentially futile. After you read them, you feel like saying: 'Well, suppose it is true; what of it?' "[127]

"The mills of the gods grind slowly. Nothing of the sort can truthfully be said, however, of a good many of those used by our contemporaries in education. In the name of 'science' results are achieved overnight and announced to an expectant world with all the assurance of the enthusiast not too much hampered by practical experience.

"Perhaps the extreme case is that of the examination and treatment of a fourth-grade pupil, found to be deficient in reading. After a brief diagnosis and application of 'remedial measures,' the announcement is gravely made that in the light of this experience we may safely assume that the proper method of dealing with all fourth-grade pupils having similar disabilities is that used in this case. Making a sweeping generalization on the basis of a single instance would seem to exhaust the possibilities of the scientific method in education and leave nothing to be desired in the way of economy, efficiency, and dispatch. Many of the 'conclusions' appended to recent 'scientific' investigations have little more to support them. We are in a fair way to be able to prove anything. A few figures and a graph will turn the trick."[128]

"Researchers in this field must cultivate to a higher degree ability to hold judgment in suspense until all the evidence is in. . . .

"We are too prone to be carried away by the new thing. Just now the intelligence tests are attacked by the type of criticism that they should have had from their friends from the first, friends who, because of inability to hold

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[124]Editorial. "Fundamentalism in Research," *Journal of Educational Research,* 9:331, April, 1924.

[125]Trabue, M. R. "Educational Research in 1925," *Journal of Educational Research,* 13:344, May, 1926.

[126]Trabue, M. R. "Special Applications of the Scientific Method to Educational Measurements," *School and Society,* 21:486, April 25, 1925.

[127]Whipple, G. M. "The Improvement of Educational Research," *School and Society,* 26:251, August 27, 1927.

[128]Editorial. "Assuming the Major Premise," *The Journal of Educational Method,* 2:229. February, 1923.

final judgment in suspense and a lack of technique in presenting results, claimed too much without intending to do so, and have been unwittingly led into a false situation."[129]

The present writers are inclined to accept these criticisms as just evaluations of the educational research of the past ten years. By this statement they do not mean to imply that some of the research is not of high merit. There have been a number of valuable studies, especially of the fact-finding type, but on the average the educational research of the past ten years cannot be rated very high on the scale of quality.

It is difficult, perhaps impossible, to compare the quality of the educational research of the past ten years with that before 1918. The earlier period was one of pioneering and crudities were to be expected, but with the passing of the pioneer period the standards for judging the quality should be materially higher. If comparisons are made on an absolute basis, it is undoubtedly true that the quality is much higher, but it seems doubtful whether the growth in quality has kept pace with the other phases of development.

Some enthusiasts have given the impression that educational research is revolutionizing school practice. The following statement from the first issue of the *Journal of Educational Research* is typical.

> Investigations have never been more numerous. Old prejudices have been abandoned. Precedent has meant less than ever before. A new sense of values has been created, and time-honored processes have been challenged. Some of them have stood the test and have been retained; others have been rejected; while still others have been modified and redirected.[130]

Such assertions appear to express a hope rather than an accomplishment, and more critical writers have frankly pointed out that as yet research is exercising only a limited influence upon educational practice.

> "Scientific method in college administration and college teaching must still be mainly a prophecy. Not much can be said about its application to date. . . .
>
> "I can not refrain from recording here that anything closely approaching exactness in measurement of the products resulting from college teaching is not believed possible at this time. All measurement is subject to some error or variation, and measurements of the less tangible things—character changes and the like—must always remain less exact than the more tangible things, such as weight and distance."[131]
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> "The chief service of contributions in the field of educational research up to the present time has undoubtedly been in pointing out problems and methods of approach. We are not yet ready to accept the conclusions of research studies as final. We are not always satisfied that the answer found is correct. Very

[129] Newlon, J. H. "What Research can do for the Superintendent," *Journal of Educational Research*, 8:111, September, 1923.

[130] Buckingham, B. R. (Editor). "Announcement," *Journal of Educational Research*, 1:4, January, 1920.

[131] Kelly, F. J. "Scientific Method in College Administration and College Teaching," *School and Society*, 20:390, September 27, 1924.

few, if any, lines of investigation have been carried to their logical conclusion. Nevertheless we are finding how to arrive at the truth. What has been done thus far has stimulated the educational world to the point of doing some real thinking as to whither it is bound and how it is to make the point proposed."[132]

The outlook. Although the present status of educational research is frequently disappointing to the practitioner who seeks assistance from published reports, the outlook is not without promise. The fact that numerous authorities in the field are calling attention to shortcomings of current research is encouraging. There appears to be a recession from the enthusiasm for popularizing educational research and a growing realization that most problems require trained workers. An increasing number of reports of research reflect an appropriately critical attitude on the part of the worker and the worship of objective methods appears to be passing. The interest in summarizing investigations within a given field is also a wholesome tendency.[133]

The present Director of the Bureau of Educational Research at the University of Illinois has been intimately connected with research activities since 1914. As he has critically examined his own work and that of others, he has, at times, been pessimistic in regard to the value of educational research. Much of the material published appears to be subject to such serious limitations that it can not be credited with much value. However, after spending several months in examining reports of educational research and in reading the comments of others, his attitude is, on the whole, optimistic. To him, one of the most encouraging signs is the critical attitude reflected in the writings of a number of the leaders in the field. When research workers become critical of their own efforts and tend to appraise them at their true value, there is hope for the future. The day of "high-pressure salesmanship" is passing and the dawn of critical, persistent, intelligently directed endeavor is approaching.

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[132]Theisen, W. W. "Recent Progress in Educational Research," *Journal of Educational Research*, 8:314, November, 1923.

[133]*See* p. 77-78.

CHAPTER IV

RESEARCH IN EDUCATIONAL MEASUREMENT

PART I. BEFORE 1918

The beginning of educational measurement. Although there has been educational measurement practically ever since education began, the movement as known today is of comparatively recent origin. Within a generation, standardized objective testing, both of intelligence and of achievement, has grown from very rudimentary beginnings until it is now a widespread, indeed almost a universal, movement. Undoubtedly many early teachers had conceived the idea of objective or standardized tests, or both, but practically no accounts thereof have been handed down, and it appears that no attention was attracted by such efforts before the beginning of the present century. Apparently, the only definitely reported work of this sort is that of an English schoolmaster, the Reverend George Fisher, about 1864.[1] He constructed a "Scale Book" by assembling samples of various degrees of proficiency and typical questions in several school subjects. The samples of proficiency were arranged in order of increasing merit and were numbered from one to five by fourths. The questions were designed to serve as models for the construction of future examinations that would be of the same nature and difficulty as previous ones. Although this "Scale Book" of Fisher's contained the germ of a number of the principles employed in educational measurement today, his work appears to have been isolated and to have left no enduring results.

The work of Rice (1894-97). It was not until thirty years later, in 1894, that a second event worthy of mention in connection with the measurement of achievement occurred. In this year, Dr. J. M. Rice conceived the idea of giving a uniform spelling test[2] to pupils in a number of cities. A year or two later, he tested a considerable number of pupils in arithmetic and language.[3] His work at once attracted some

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[1]Chadwick, E. B. "Statistics of Educational Results," *The Museum, A Quarterly Magazine of Educational Literature and Science*, 3:479-84, January, 1864.

[2]Rice, J. M. "The Futility of the Spelling Grind," *Forum*, 23:163-72, 409-19; April, June, 1897.

[3]Rice, J. M. "Educational Research: A Test in Arithmetic," *Forum*, 34:281-97, October-December, 1902.

Rice, J. M. "Educational Research: Causes of Success and Failure in Arithmetic," *Forum*, 34:437-52, January-March, 1903.

Rice, J. M. "Educational Research: Talent vs. Training in Teaching," *Forum*, 34: 588-607, April-June, 1903.

Rice, J. M. "Educational Research: The Results of a Test in Language," *Forum*, 35: 269-93, October-December, 1903.

Rice, J. M. "English, the Need of a New Basis in Education," *Forum*, 35:440-57, January-March, 1904.

Rice, J. M. *Scientific Management in Education*. New York: Hinds, Noble and Eldredge, 1912. Chapters V, VI, VII, VIII, IX, X, and XI contain the same material as is given in the preceding six references by Rice.

attention and discussion, most of which was hostile. Indeed, when his results were reported at the meeting of the Department of Superintendence in 1897, they were scorned and ridiculed. Despite the general unfavorable attitude, however, a few farseeing educators disagreed with the majority, so that the idea suggested by Rice was not permitted to sink into oblivion. For ten years, however, no apparent progress was made along the line of testing the achievements of pupils.

Galton (1869 —) and Cattell (1890 —). In the meantime, more definite activity was taking place in the other of the two major divisions of educational measurement, now commonly referred to as intelligence testing. The work of Sir Francis Galton[4] on the differences in the mental abilities of individuals, and that of J. McKeen Cattell[5] and other American psychologists who did further work of the same sort and refined the methods of measurement, may be said to have marked the beginning of modern intelligence testing. As a result of their studies, these men secured more definite evidence of the existence of individual differences. Most of their tests dealt with sense-perception, although some of the traits measured were practically the same as those measured by portions of many of our present-day mental tests. These pioneers, however, did not combine the results of separate tests to secure a general mental rating or score. Although their tests appear crude in comparison with the intelligence tests of today, these men rendered valuable service by stimulating interest in mental measurements.

Thorndike (1904 —) and Binet (1905-11). About the middle of the first decade of the twentieth century there occurred two events which marked distinct advances in educational measurement, and which had a strong stimulating influence upon workers in this field. Thorndike, who for some years had been working under Cattell, Boas, and others in the fields of statistics and psychology, published the first book[6] dealing directly with mental measurement. This volume was devoted to statistical methods and fundamental principles of test construction. For ten years or more it remained the standard, indeed the only, book of its kind and was generally studied by students of educational measurements. A year later, in 1905, Binet, who had been

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[4]Galton, Francis. *Hereditary Genius: An Inquiry Into Its Laws and Consequences.* London: Richard Clay and Sons, 1869. (New and revised edition, with American Preface.) New York: D. Appleton and Company, 1871, 390 p.; second edition, London: The Macmillan Company, 1892, 379 p.

Galton, Francis. *Inquiries into Human Faculty and Its Development.* London: The Macmillan Company, 1883. 387 p.

[5]Cattell, J. McK. "Mental Tests and Measurements," *Mind,* 15:373-80, July, 1890.

Cattell, J. McK. and Farrand, Livingston. "Physical and Mental Measurements of the Students of Columbia University," *Psychological Review,* 3:618-48, November, 1896.

[6]Thorndike, E. L. *An Introduction to the Theory of Mental and Social Measurements.* New York: Teachers College, Columbia University, 1904. 277 p. (Revised edition, 1913.)

working with psychological tests in France for some ten or fifteen years, devised and published in collaboration with Simon the now well-known Binet-Simon General Intelligence Scale.[7] This was an individual scale which combined tests of a number of different kinds into a single scale and provided for the interpretation of pupils' responses in terms of mental age. It was revised in 1908[8] and again in 1911.[9] It has been translated with more or less modification into many languages and has generally been accepted as the standard for intelligence scales.

American revisions of the Binet-Simon Scale (1908-16). The first noteworthy use of the Binet-Simon Scale in this country was made by Goddard,[10] beginning in 1908. At first he employed a fairly exact translation, but in 1911 he published a revision[11] of the scale. In 1912, a revision by Kuhlmann[12] appeared. Although these and one or two other American revisions were used by a number of psychologists and investigators, it was not until the appearance of the Stanford Revision by Terman, assisted by Childs and others, that individual intelligence testing really became fairly common. This scale, which first appeared in 1912[13] and was made generally available in 1916,[14] became practically at once the standard individual intelligence scale in the English language and has continued so to the present, although one or two others of high merit have appeared.

Early tests by Thorndike and his co-workers (1908-13). During this period of the development of individual intelligence scales, a beginning was also made in the construction of standardized tests for measuring achievement in school subjects. In 1908, Stone, a student under Thorndike, published his arithmetic reasoning test,[15] which is considered the first standardized achievement test, as those used by Rice hardly fulfilled all the necessary conditions. This was followed

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[7]Binet, A. et Simon, T. "Methodes Nouvelles pour le Diagnostic du Niveau Intellectuel des Anormaux," *L'Année Psychologique,* 11:191-244, 1905.

[8]Binet, A. et Simon, T. "Le Développement de l'Intelligence chez les Enfants," *L'Année Psychologique,* 14:1-90, 1908.

[9]Binet, A. "Nouvelles Recherches sur la Mesure du Niveau Intellectuel chez les Enfants d'Ecole," *L'Année Psychologique,* 17: 145-201, 1911.

[10]Goddard, H. H. "Four Hundred Feeble-Minded Children Classified by the Binet Method," *Pedagogical Seminary,* 17:387-97, September, 1910.

Goddard, H. H. "Two Thousand Children Measured by the Binet Measuring Scale of Intelligence," *Pedagogical Seminary,* 18:232-59, June, 1911.

[11]Goddard, H. H. "A Revision of the Binet Scale," *Training School Bulletin,* 8:56-62, June, 1911.

[12]Kuhlmann, F. "A Revision of the Binet-Simon System for Measuring the Intelligence of Children," *Journal of Psycho-Asthenics, Monograph Supplement,* Vol. 1, No. 1, September, 1912.

[13]Terman, L. M. and Childs, H. G. "A Tentative Revision and Extension of the Binet-Simon Measuring Scale of Intelligence," *Journal of Educational Psychology,* 3:61-74, 133-43, 198-208, 277-89; February, March, April, May, 1912.

[14]Terman, L. M. *The Measurement of Intelligence.* Boston: Houghton, Mifflin Company, 1916. 362 p.

Terman, L. M., *et al. The Stanford Revision and Extension of the Binet-Simon Scale for Measuring Intelligence.* Baltimore: Warwick and York, 1917. 179 p.

[15]Stone, C. W. "Arithmetical Abilities and Some Factors Determining Them," *Teachers College, Columbia University Contributions to Education,* No. 19. New York: Bureau of Publications, Columbia University, 1908. 101 p.

in the next few years by several other tests and scales, practically all of which were constructed by a small group of persons rather closely associated with Thorndike. Courtis, who had found Stone's test unsatisfactory for the purpose of establishing norms of achievement for different grades, devised his Arithmetic Tests, Series A,[16] for this purpose and made them available in 1909.[17] The same year, Thorndike presented his handwriting scale before Section L of the American Association for the Advancement of Science and published it the following year.[18] In 1912, the Hillegas Composition Scale[19] appeared. This and the Thorndike Handwriting Scale are examples of a type of measuring instrument different from the arithmetic tests of Stone and Courtis. The latter were tests in the ordinary sense of the word; that is, they were composed of exercises to be done by pupils. On the other hand, the scales of Thorndike and Hillegas consisted respectively of series of samples of handwriting and English composition with which pupils' performances were to be compared. In 1913 appeared the Buckingham Spelling Scale,[20] noteworthy as being the first example of a new type of measuring instrument. The difficulty of the words included had been determined according to the per cents of correct spellings by school pupils. The words were then arranged in order of increasing difficulty. Thus, there was produced a spelling scale such that practically all pupils except beginners could spell the first words and very few could spell the last ones.

Ayres' Handwriting and Spelling Scales (1912-15). During the five years immediately following the appearance of Stone's arithmetic test, the only contribution in this field by a person not directly inspired by Thorndike was made by L. P. Ayres. In 1912, he published the first of his handwriting scales,[21] commonly known as the Three-Slant Edition. Although this was intended to be used in the same manner as Thorndike's, the method of determining the values of the samples included was entirely different, being based upon supposedly objective indices of legibility. Within the next few years, Ayres constructed a scale for adult handwriting[22] and a revision of his first scale. This,

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[16]Courtis, S. A. *Manual of Instructions for Giving and Scoring the Courtis Standard Tests in the Three R's.* Detroit, Michigan: Department of Cooperative Research, 1910.

[17]Courtis' Standard Research Tests in Arithmetic, Series B, which cover the four fundamentals and have received probably the widest use of any standardized tests, were not constructed until some four or five years later than his Series A.

[18]Thorndike, E. L. "Handwriting," *Teachers College Record,* 11:1-93, March, 1910.

[19]Hillegas, M. B. "A Scale for the Measurement of Quality in English Composition by Young People," *Teachers College Record,* 13:331-84, September, 1912.

[20]Buckingham, B. R. "Spelling Ability: Its Measurement and Distribution," *Teachers College, Columbia University Contributions to Education,* No. 59. New York: Bureau of Publications, Columbia University, 1913. 116 p.

[21]Ayres, L. P. "Scale for Measuring the Quality of Handwriting of School Children," *Russell Sage Foundation, Bulletin* E-113. New York City: Russell Sage Foundation, 1912. 16 p.

[22]Ayres, L. P. "Scale for Measuring the Handwriting of Adults," *Russell Sage Foundation Bulletin,* E-138. New York City: Russell Sage Foundation, 1915. 12 p.

ordinarily called the Gettysburg Edition, is undoubtedly the most widely used handwriting scale. His spelling scale,[22a] published in 1915, consisted of the one thousand words found to be of most common occurrence in a large amount of correspondence. These words were classified on a basis of difficulty and placed in columns. These were arranged in order of increasing difficulty and each had at the top the norms for the grades in which the words of the column were considered appropriate.

Other early tests (1913-15). It may be said that from 1908 to 1913, roughly speaking, each year was marked by the appearance of one standardized test or scale. Since then, there has been a rapid increase in the number of tests issued annually. It is therefore impracticable to name all of the tests and scales which were published in the few years following 1913. The following, which appeared not later than 1915, may, however, be mentioned to show the subjects being dealt with: Starch's Reading Tests,[23] his Grammatical Scales, Punctuation Scale, Grammar Tests,[24] and his Latin Vocabulary and Reading Tests;[25] Thorndike's Visual Vocabulary,[26] Understanding of Sentences[27] Scales, and his Scale for the Merit of Drawings by Pupils 8 to 15 Years Old;[28] the Kansas Silent Reading Tests;[29] and the Trabue Completion Test Language Scales.[30]

Of the tests and scales mentioned in the preceding paragraph, Thorndike's three scales and the Kansas Silent Reading Tests have undoubtedly been of most importance in the actual measurement of achievement. For a number of years, Thorndike's Visual Vocabulary and Understanding of Sentence Scales received wide use; indeed the former is still occasionally employed. The latter, however, has been superseded by the Thorndike-McCall Reading Scale for the Understanding of Sentences.[31] This includes ten duplicate forms, the largest

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[22a]Ayres, L. P. "A Measuring Scale for Ability in Spelling," *Russell Sage Foundation Bulletin* E-139. New York City: Russell Sage Foundation, 1915. 56 p.

[23]Starch, Daniel. "The Measurement of Efficiency in Reading," *Journal of Educational Psychology*, 6:1-24, January, 1915.

[24]Starch, Daniel. "The Measurement of Achievement in English Grammar," *Journal of Educational Psychology*, 6:615-26, December, 1915.

[25]Starch, Daniel. "The Measurement of Ability in Latin," *Educational Measurements*. New York: Macmillan Company, 1916, Chapter XI.

[26]Thorndike, E. L. "The Measurement of Ability in Reading," *Teachers College Record*, 15:207-77, September, 1914.

[27]Thorndike, E. L. "An Improved Scale for Measuring Ability in Reading," *Teachers College Record*, 16:445-53, November, 1915; 17:40-67, January, 1916.

[28]Thorndike, E. L. "The Measurement of Achievement in Drawing," *Teachers College Record*, 14:345-83, November, 1913.

[29]Kelly, F. J. "The Kansas Silent Reading Tests," *Journal of Educational Psychology*, 7:63-80, February, 1916.

[30]Trabue, M. R. "Completion Test Language Scales," *Teachers College, Columbia University Contributions to Education*, No. 77. New York: Bureau of Publications, Columbia University, 1916. 118 p.

[31]Thorndike, E. L. and McCall, W. A. *Thorndike-McCall Reading Scale for the Understanding of Sentences*. New York: Bureau of Publications, Teachers College, Columbia University, 1920.

number for any standardized test of achievement, and is among the few most widely-used reading tests. For years the Thorndike Drawing Scale was practically the only one employed, although recently one or two others of high merit have appeared. The Kansas Silent Reading Tests, constructed by F. J. Kelly, were used extensively for a few years, but are chiefly deserving of mention as forming the basis for the Monroe Standardized Silent Reading Tests.[32] These tests, including both the original and a revised edition,[33] have had the widest use of any tests in the subject covered. Trabue's Completion Test Language Scales have also been used in large numbers, but for the measurement of general intelligence rather than for that of language ability.

Influence of the school survey movement (1907 —). The school survey movement[34] is generally considered to have begun with the Pittsburgh Survey in 1907, but achievement tests were not used until the survey of New York City[35] was made in 1911-12. Courtis, who was a member of the Survey Commission, had his Arithmetic Tests, Series A, given to about 30,000 pupils. Since that time, there have been few surveys of any note which have not employed standardized tests. The survey movement, therefore, has exerted a very strong stimulating influence upon the development and use of educational tests.

Influence of educational periodicals. The demand for tests was increased also by the fact that educational periodicals began to devote considerable space to articles dealing with the construction and use of tests, the statistical methods involved, and related topics. One of the more important of such periodicals was the *Teachers College Record,* in which appeared several of Thorndike's important studies dealing with tests and also a number by other writers. Although the *Journal of Educational Psychology,* founded in 1910, did not at first devote as large a proportion of its pages to this movement as it did some years later, it contained many articles on measurement. *Educational Administration and Supervision,* from the date of its first publication in 1915, included many reports of work with tests. *School and Society,* which likewise first appeared in 1915, made a policy of including one research article each week. In most cases these articles were in the field of measurements. The *Elementary School Journal,* originally

[32]Monroe, W. S. "Monroe's Standardized Silent Reading Tests," *Journal of Educational Psychology,* 9:303-12, June, 1918.

[33]Monroe, W. S. "The Illinois Examination," *University of Illinois Bulletin,* Vol. 19, No. 9, Bureau of Educational Research Bulletin No. 6. Urbana: University of Illinois, 1921. 70 p.

[34]*See* p. 38-40 for a description of the school survey movement.

[35]"Final Report of Committee on School Inquiry, Board of Estimate and Apportionment." New York City: The Committee, 1911-1913. 3 vols.

called the *Elementary School Teacher,* and the *School Review* frequently contained one or two articles along this line in each issue. In addition to these, other periodicals of less importance or devoting less attention to the educational measurement movement in the aggregate exerted a great influence in acquainting teachers with what was being done and with the possibilities to be realized from the use of standardized tests.

Indiana University Conference on Educational Measurements (1914 —). The growth of the educational measurement movement has been greatly stimulated by addresses and demonstrations at local teachers' meetings, educational conferences, state associations, county institutes, and so forth. Among such meetings, the Indiana University Conference on Educational Measurements deserves special mention. The first one was held in the spring of 1914 and since that time the Conferences have continued annually without a break. The speakers at these meetings have included Ashbaugh, Ayres, Ballou, Buckingham, Charters, Courtis, Cubberley, Dearborn, Goddard, Gray, Horn, Judd, Monroe, Pintner, the Presseys, Seashore, Strayer, Thorndike, Whipple, and Woody. In addition, members of the faculty of Indiana University and a number of schoolmen of the state have contributed to the programs.

The organization of research bureaus (1912 —). Reference should probably be made here also to the stimulus given the testing movement by the organization of state, city, university, and other bureaus of research or measurements. Since the founding and development of such bureaus is treated elsewhere[36] in this publication, little will be said about them here. The establishment of these organizations for educational research began about 1912 and a number became active within the next three or four years. In most cases, attention during the first few years of their existence was centered almost entirely upon the construction and use of tests. The combined influence of the various bureaus in developing and popularizing standardized tests was very great.

The first group intelligence scales (1917). Near the end of the period prior to 1918, activities began in several divisions of the general field of educational measurements in which little had been done previously. Otis, working under Terman, was completing his work upon what is generally considered the first group intelligence scale.[37]

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[36] *See* p. 32-33.

[37] Otis, A. S. "An Absolute Point Scale for the Group Measurement of Intelligence," *Journal of Educational Psychology,* 9:239-61, 333-48; May, June, 1918.

Pintner[38] had employed several group tests in making what he called a mental survey, but they were not really combined into a single scale, and they differed significantly from the modern intelligence tests. Otis' scale was practically complete when the United States entered the World War, but its publication was temporarily delayed because Otis turned over the products of his work to the committee in charge of the psychological testing in our military forces. This committee adopted Otis' scale as the basis in constructing the well-known Army Alpha Scale[39] in 1917 and 1918. This committee also constructed the Army Beta Tests[40] during the same period. As most readers probably know, these were a series of non-verbal tests intended for use with illiterates, whereas the Army Alpha Scale required the possession of at least a moderate degree of reading ability.

The first score card for school buildings (1916). The score card for school buildings represents another type of measuring instrument which was developed prior to 1918. The first of the Strayer-Engelhardt series of score cards appeared in 1916,[41] and seems to have been the first attempt of any consequence to formulate comprehensive objective standards and to apply them to the rating of school buildings.

Books on educational measurement (1904-17). Thorndike's *Introduction to the Theory of Mental and Social Measurements,* already referred to,[42] stood alone as a textbook in this field for more than ten years,[43] but shortly before 1918 several other volumes of interest and assistance to workers came from the press. In 1916 appeared Starch's *Educational Measurements,*[44] which consisted of two or three chapters on school marks, followed by ten or twelve chiefly devoted to the reproduction of tests and scales in as many school subjects. These, of which a large proportion were constructed by Starch himself, included practically all those available at the time the book was published. In addition to reproducing the tests, Starch included norms for most of

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[38] Pintner, Rudolf. "A Mental Survey of the School Population of a Village," *School and Society,* 5:597-600, May 19, 1917.
Pintner, Rudolf. *The Mental Survey.* New York: D. Appleton and Company, 1918. 116 p.

[39] Yerkes, R. M. (Editor). *Psychological Examining in the United States Army, Memoirs of the National Academy of Sciences,* Vol. 15. Washington: Government Printing Office, 1921. 890 p.

[40] *Ibid.*

[41] Strayer, G. D. "Score Card for City School Buildings," *Fifteenth Yearbook of the National Society for the Study of Education,* Part I. Bloomington, Illinois: Public School Publishing Company, 1916, p. 41-51.

[42] *See* p. 36.

[43] Whipple's *Manual of Mental and Physical Tests* had been published in 1910, but it was concerned with psychological tests as distinguished from educational tests and, therefore, had value for workers in psychological laboratories rather than for those chiefly interested in ordinary classroom teaching. *See:*
Whipple, G. M. *Manual of Mental and Physical Tests.* Baltimore: Warwick and York, 1910. 534 p. (Revised edition, 1914. Part I, 365 p. Part II, 336 p.)

[44] Starch, Daniel. *Educational Measurements.* New York: The Macmillan Company, 1916. 202 p.

them, brief accounts of their derivation, and in some cases criticisms and suggestions for use. A second publication of the same year was Part I of the *Fifteenth Yearbook of the National Society for the Study of Education,*[45] prepared by a committee headed by Strayer. This yearbook dealt chiefly with the use of about a dozen different achievement tests, but also included chapters on physical measurements, rating school buildings, and intelligence testing. It was not, however, until the appearance of Monroe, DeVoss, and Kelly's *Educational Tests and Measurements*[46] in the following year that there was available in a single volume a fairly comprehensive treatise on the use of achievement tests. This book described practically all of the tests available at the time of its publication, but devoted most of its space to the criticism of these tests and to a discussion of the uses to which test results should be put. Within a short time, this volume became decidedly popular with classroom teachers and others, and has remained so ever since. It undoubtedly deserves credit for doing more than any other single publication to encourage the use of tests and to acquaint those employing them with proper methods of use. In 1917 also appeared Rugg's *Statistical Methods Applied to Education,*[47] which was the first book to furnish workers with a fairly adequate treatment of the elements of statistical method necessary for handling test scores and similar data.

Status of the educational measurement movement at the beginning of 1918. To sum up in a few sentences the status of the educational measurement movement at the beginning of 1918, the following generalizations may be made. Many school administrators and others were still definitely hostile and probably still more were neutral toward the movement, but it had passed its most critical period from the standpoint of survival, and had acquired considerable momentum. A number of well-standardized and widely-used achievement tests in the elementary-school subjects and also several excellent individual intelligence scales were available. Few standardized tests had appeared in the high-school subjects, and group intelligence tests were in their infancy. A beginning had also been made in the objective measurement of school buildings. Only a few texts or complete volumes dealing with the movement had yet appeared, but of these, two or three

[45]Strayer, G. D., *et al.* "Standards and Tests for the Measurement of the Efficiency of Schools and School Systems," *Fifteenth Yearbook of the National Society for the Study of Education,* Part I. Chicago: University of Chicago Press, 1916. 172 p.

[46]Monroe, W. S., DeVoss, J. C. and Kelly, F. J. *Educational Tests and Measurements.* Boston: Houghton, Mifflin Company, 1917. 309 p. (Revised and enlarged edition, 1924. 521 p.)

[47]Rugg, H. O. *Statistical Methods Applied to Education.* Boston: Houghton, Mifflin Company, 1917. 410 p.

were of distinctly high merit and were rapidly becoming well known. Furthermore, many periodicals were in the aggregate devoting a considerable amount of space to the movement; many speakers were explaining and advocating the use of objective methods of measurement; and many administrators, teachers, and others were actually employing them.

PART II. 1918 TO 1927

Testing in the United States Army (1917 —). Probably the one outstanding event in the field of educational measurements which marked 1918 was the continuation and elaboration of the testing program initiated in the United States Army in 1917.[48] A group of the most prominent psychologists of this country constructed the tests used, and formulated and directed the program, and many other psychologists, probably a majority of those of any professional standing, participated in carrying it out. Most of the testing was done by means of the Army Alpha and Beta Scales, but the Stanford Revision of the Binet-Simon Tests, various performance scales, tests of mechanical ability and aptitude, literacy tests, and so forth, were also employed. The chief purpose was to measure the general intelligence of recruits so that those who appeared to be of too low ability to become acceptable soldiers could be detected and employed for the necessary simple manual labor connected with the army and also so that those of various higher degrees of intelligence could be classified and trained or employed in the most efficient way. Another important type of testing had as its purpose the discovery of vocational abilities of various sorts, so that carpenters, plumbers, masons, and workers in many other occupations could be selected and employed. Altogether, about two million men were tested, a number sufficient to render this by far the greatest psychological and educational measurement program ever carried out. The work did not cease with the end of the war but was adopted to some extent as a permanent feature of army routine. It was inevitable that such an extensive application of tests should have a great influence in encouraging their use elsewhere. Perhaps this stimulation was greater than was best for the development of the movement. It seems probable that much of the non-critical use of tests and the unwarranted interpretation of results which were so common during the few years following the war may in large measure be traced back to the more or less wholesale methods used in the army.

Early group intelligence tests (1918-20). The year 1918 was also the date of the appearance of the first group intelligence scale designed

[48] *See* p. 94-95.

for school use, that of Otis.[49] This was soon followed by a number of others of which probably the most notable were the National Intelligence Tests.[50] These tests, which consist of Scales A and B, were prepared under the auspices of the National Research Council by five of the leading educational psychologists of the country, Haggerty, Terman, Thorndike, Whipple, and Yerkes. The members of this committee had played a large part in the psychological testing in the army, and it was hoped that this experience could be capitalized by collaboration and that in this way a well-nigh perfect intelligence test could be produced. Although it appears that this expectation was not realized, the National Intelligence Tests are generally considered the best yet available for use in the intermediate and upper grades of the elementary school, and from the time of publication to the present they have received very wide use. It is interesting to note that within a short time after these tests appeared each of the five co-authors except Yerkes devised a group intelligence scale, thus implying that the National Intelligence Tests could be improved. In addition to these tests, a few other group intelligence scales appeared during 1919 and 1920, and since that time every year has been marked by the appearance of a considerable number. During the past two or three years, however, fewer scales have been constructed.

The Seventeenth Yearbook (1918). The year 1918 was also marked by the publication of Part II of the *Seventeenth Yearbook of the National Society for the Study of Education,*[51] which was devoted to educational measurement. This volume was prepared by a committee of the National Association of Directors of Educational Research.[52] Courtis was chairman of this committee. The volume consists of thirteen chapters, each being contributed by a leader in the field of educational measurement. Taken as a whole these chapters present a fairly complete and satisfactory discussion of the history, status, and purposes of the measurement of achievement. The work of various research bureaus and organizations is discussed, almost all of the then existing tests and scales are described, practical uses of measurement are pointed out, elementary statistical methods are explained, several types of educational research are briefly discussed, and a very complete bibliography of more than six hundred references completes the

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[49] *See* p. 94.

[50] Whipple, G. M. "The National Intelligence Tests," *Journal of Educational Research,* 4:16-31, June, 1921.

[51] Courtis, S. A., *et al.* "The Measurement of Educational Products," *Seventeenth Yearbook of the National Society for the Study of Education,* Part II. Bloomington, Illinois: Public School Publishing Company, 1918. 192 p.

[52] This organization has since changed its name to the Educational Research Association.

volume. Altogether, in view of the time at which it appeared and the quality and scope of the contributions that compose it, Part II of the *Seventeenth Yearbook* ranks as one of the outstanding publications in the field of measurements.

Although this volume contains much that is valuable, one sentence has probably been outstanding in its influence. At the very beginning of Chapter II, which is entitled "The Nature, Purposes, and General Methods of Measurements of Educational Products," Thorndike placed his now well-known dictum: "Whatever exists at all exists in some amount." This statement stimulated much controversial discussion. It has been attacked and defended with equal warmth. On the whole, however, it has been generally accepted by workers in this field, and one may say that this statement has become the cornerstone upon which the structure of educational measurements has been raised.

General survey tests—Pintner's work (1918-20). One of the important developments of this period has been the organization of tests into groups or batteries for general survey purposes. Such batteries include achievement tests in several school subjects and frequently also an intelligence test. The publication of a number of tests in a single booklet relieves the teacher or other user from the task of selecting the particular tests to be used. It also facilitates the administration of the tests. Usually, the author of a battery of tests provides a method for combining the several achievement scores into a single measure.

Pintner's *Educational Survey Test*[53] consisted of short selections from eight already existing standardized achievement tests. No intelligence test was included, but the recommendation was made that the Mental Survey Scale[54] by the same author be used in connection with the achievement tests. In connection with the combined use of the educational and mental survey scales, Pintner suggested a mental index to express general intelligence and an educational index to express achievement,[55] and recommended that the difference between these two indices be taken as a measure of how well a school pupil is capitalizing his mental ability.[56]

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[53]Pintner, Rudolf and Fitzgerald, Florence. "An Educational Survey Test," *Journal of Educational Psychology*, 11:207-23, April, 1920.

[54]Pintner, Rudolf. "A Non-Language Group Intelligence Test," *Journal of Applied Psychology*, 3:199-214, September, 1919.

[55]Pintner, Rudolf, and Marshall, Helen. "A Combined Mental-Educational Survey," *Journal of Educational Psychology*, 12:32-43, 82-91; January, February, 1921.

[56]Pintner had suggested the desirability of comparing achievement with ability and had even made such comparisons two or three years earlier, but had not provided a unified battery of achievement tests nor suggested any very satisfactory means of making the comparisons. *See* references on p. 95.

The Illinois Examination and the achievement quotient (1920). In 1920, the Illinois Examination,[57] prepared by B. R. Buckingham and W. S. Monroe, appeared. It consisted of the Monroe General Survey Scale in Arithmetic, the Monroe Standardized Silent Reading Test Revised, and the Illinois General Intelligence Scale. Thus, instead of covering most of the elementary-school subjects as had Pintner's Test, the Illinois Examination was limited to the two most important ones. This battery of tests is especially distinguished by the fact that in connection with it the now well-known and widely-used terms "achievement age" and "achievement quotient" were first employed. The former is used to express a pupil's score on an achievement test in a fashion similar to that in which his mental age expresses his score upon an intelligence test. The achievement quotient, which is obtained by dividing achievement age by mental age, expresses his achievement relative to his capacity. Achievement age and achievement quotient are relatively easy to understand, and probably for this reason they have been employed much more frequently than the index and difference method proposed by Pintner.

The Pressey Scales of Attainment (1920-21). At approximately the same time that Pintner, and Buckingham and Monroe were making available their batteries of tests, the Presseys were engaged in similar work. They published Scale of Attainment No. 1,[58] intended for the second grade, which consisted of spelling, word recognition, sentence understanding, and simple arithmetic tests; Scale No. 2,[59] which covered eighth-grade history, arithmetic, and English; and Scale No. 3,[60] which dealt with third-grade spelling, reading, and arithmetic. Although no intelligence tests were included, the Presseys urged that they be used in connection with the Scales of Attainment, and that the scores made on the latter be interpreted in the light of pupils' capacities.

The Stanford Achievement Test (1922). During the period since the appearance of the batteries of tests already mentioned, a number of others of the same general character have been constructed and pub-

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[57]Monroe, W. S. and Buckingham, B. R. *Illinois Examination. Teacher's Handbook.* Urbana, Illinois: Bureau of Educational Research, University of Illinois, July, 1920. 32 p.

Monroe, W. S. "The Illinois Examination," *University of Illinois Bulletin,* Vol. 19, No. 9, Bureau of Educational Research Bulletin No. 6. Urbana: University of Illinois, 1921. 70 p.

[58]Pressey, L. C. "Scale of Attainment No. 1.—An Examination of Achievement in the Second Grade," *Journal of Educational Research,* 2:572-81, September, 1920.

[59]Pressey, S. L. "Scale of Attainment No. 2.—An Examination for Measurement in History, Arithmetic, and English in the Eighth Grade," *Journal of Educational Research,* 3:359-69. May, 1921.

[60]Pressey, L. C. "Scale of Attainment No. 3.—For Measuring 'Essential Achievement' in the Third Grade," *Journal of Educational Research,* 4:404-12, December, 1921.

lished. Most of these have been intended for elementary-school use, but two or three cover high-school subjects. The Stanford Achievement Test,[61] published in 1922, undoubtedly holds first place. It consists of the Primary Examination for Grades II and III, which includes reading, arithmetic and spelling, and the Advanced Examination for Grades IV to VIII, which includes nature-study and science, history and literature, and language, in addition to the subjects in the Primary Examination. Besides being the most complete and most reliable of the batteries of tests, the Stanford Achievement Test in many other ways deserves the high rank it has been generally accorded and the wide use it has received. Although it does not possess the diagnostic value of some series of tests, everything considered, it probably represents as high a point as has been reached in the technique of test construction.

The accomplishment quotient and ratio suggested by Franzen (1920-22). About the same time that the Illinois Examination and the accompanying achievement quotient became known, Franzen suggested the same idea, using, however, the expression "accomplishment quotient."[62] The term "attainment quotient" has also occasionally been used with the same significance. Franzen and others employed "subject age" instead of "achievement age" to refer to achievement in a single subject, and "educational age" to refer to average achievement in several subjects. These ages were accompanied by the subject quotient and educational quotient, obtained by dividing subject age and educational age, respectively, by chronological age. In other words, the subject quotient and educational quotient are measures of achievement relative to age and not to ability. A little later Franzen also suggested the use of the accomplishment ratio,[63] seemingly desiring to substitute this expression for accomplishment quotient, since he gave it the same meaning.

T-scores and B-scores (1921 —). In addition to Pintner's indices and the various ages and quotients already referred to, two or three other kinds of derived scores—that is, means of expressing point scores in uniform terms or units—have been suggested. The best-known of these are undoubtedly the T-scale[64] and corresponding T-

[61] Kelley, T. L., Ruch, G. M., and Terman, L. M. *Stanford Achievement Test.* Yonkers-on-Hudson, New York: World Book Company, 1922.

[62] Franzen, Raymond. "The Accomplishment Quotient of School Marks in Terms of Individual Capacity," *Teachers College Record,* 21:432-40, November, 1920.

[63] Franzen, Raymond. "The Accomplishment Ratio," *Teachers College, Columbia University Contributions to Education,* No. 125. New York: Bureau of Publications, Columbia University, 1922. 59 p.

[64] The name T-scale was given by McCall in honor of Terman and Thorndike.

score, proposed by McCall[65] soon after the appearance of age and quotient scores. The T-scale is based upon the distribution of ability of an average or complete group of twelve-year-old pupils. Tables for transmuting point scores into corresponding T-scores have been prepared for a number of tests published by the Bureau of Publications of Teachers College and for a few other measuring instruments, but the T-scale has not been as widely accepted as the age-scale.

Another method of expressing scores which has received some use is that of the grade-score,[66] also sometimes called the B-score.[67] This expresses achievement in terms of grade standing, using an integer in units' place for the grade, and a second integer in tenths' place for the month of the school year.[68] Thus, a B or grade-score of 4.3, for example, denotes the average achievement of fourth-grade pupils in the third month of the school year.

The new examination (1920 —). In 1920, there appeared an article by McCall[69] which seems to have been the first published discussion of the new examination. This article attracted considerable attention and within a short time many persons began to experiment with and employ tests of the sort advocated. The new examination merely represents the application of the methods and types of exercises used in the construction of standardized tests to those made by the classroom teacher. The true-false type of test received most emphasis at first, but the multiple-answer, the completion, the matching, the incorrect statement, the rearrangement, and many other types and varieties have since been suggested and used. Since 1920, literally hundreds of articles describing, advocating, and criticizing new-type tests have appeared. They have also been treated in a number of books, and within the past three or four years several volumes, most of them rather small, have been devoted entirely or chiefly to the subject. The first full-size book dealing with this topic was Russell's *Classroom Tests,*[70] dated 1926. Much more complete is Odell's *Traditional Examinations and New-Type Tests.*[71] It is hardly too much to say that in many schools interest in the new examination has exerted

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[65]McCall, W. A. "A Proposed Uniform Method of Scale Construction," *Teachers College Record,* 22:31-52, January, 1921.

[66]Buckingham, B. R. *Research for Teachers.* New York: Silver, Burdett and Company, 1926, p. 181-85.

[67]The name B-score was suggested by McCall in honor of Binet and Buckingham. *See:* "B Scores." Leaflet published by Public School Publishing Company, Bloomington, Illinois.

[68]The assumption is made that the school year is composed of ten months.

[69]McCall, W. A. "A New Kind of School Examination," *Journal of Educational Research,* 1:33-46, January, 1920.

[70]Russell, Charles. *Classroom Tests.* Boston: Ginn and Company, 1926. 346 p.

[71]Odell, C. W. *Traditional Examinations and New-Type Tests.* New York: Century Company, 1928. 469 p.

a revolutionary influence on the character of the examinations administered.

Books on intelligence tests (1919-27). As was natural after the educational measurement movement was well under way, the number of published volumes devoted to its various phases rather markedly increased. For the first two or three years following 1918, there were no notable additions to the few volumes already mentioned[72] dealing with achievement tests or with educational measurements in general. In 1919, however, Terman published his *Intelligence of School Children,*[73] a companion volume to his earlier *Measurement of Intelligence.* It deals with the interpretation and use of the information gained from intelligence tests and thus supplements the former volume, which is devoted to the actual administration of the Stanford Revision. In 1922, the National Society for the Study of Education devoted its yearbook[74] to this general topic, the committee in charge being under the chairmanship of Colvin. Part I deals with the nature, history, and general principles of intelligence testing, and Part II with the practical use of such tests and their results. This yearbook constituted the first reasonably complete treatment of the topic. As regards the phases covered by Part I, comparatively few volumes worth mentioning have appeared since that time. Pintner[75] published one a year later which covers about the same scope as the yearbook. Two years later, in 1925, Peterson's *Early Conceptions and Tests of Intelligence*[76] appeared. As the title implies, this volume deals almost entirely with the history of intelligence testing, and brings it down to about 1911, but some attention is also given to the general problems involved. Freeman,[77] in 1926, published what is easily the outstanding treatise dealing with the general field of intelligence testing. The history of the movement is traced in considerable detail, all important existing tests are described, and the interpretation and use of test results critically dealt with. The volume is not limited to intelligence tests in the usual sense of the term, but takes in other mental tests, such as those of personality and so forth. Another volume of an entirely different sort, but equally as outstanding as Freeman's, is Thorndike's *Measurement of Intelli-*

[72] *See* p. 95-96.

[73] Terman, L. M. *The Intelligence of School Children.* Boston: Houghton, Mifflin Company, 1919. 317 p.

[74] Colvin, S. S., *et al.* "Intelligence Tests and Their Use," *Twenty-First Yearbook of the National Society for the Study of Education.* Bloomington, Illinois: Public School Publishing Company, 1922. 289 p.

[75] Pintner, Rudolf. *Intelligence Testing.* New York: Henry Holt and Company, 1923. 406 p.

[76] Peterson, Joseph. *Early Conceptions and Tests of Intelligence.* Yonkers-on-Hudson, New York: World Book Company, 1925. 320 p.

[77] Freeman, F. N. *Mental Tests.* Boston: Houghton, Mifflin Company, 1926. 503 p.

gence.[78] This large volume, published in 1927, does not deal with the general field as does Freeman's, but is limited to a consideration of certain important problems of intelligence testing. It is based chiefly upon the result of experimental work by Thorndike and his associates. *A Manual of Individual Mental Tests and Testing,* by Bronner and others,[79] likewise appeared in 1927. This volume is not limited to general intelligence tests in the narrow use of the term, but, in the words of the authors, describes "every adequately standardized individual mental test," as well as a number inadequately standardized. It also contains some helpful discussion of testing. A still more recent book in the same field has been written by Dearborn.[80] It is devoted to the interpretation and use of intelligence tests and their results rather than to the description of existing tests or the history of the movement. Practically all of the outstanding work in this field is summarized and evaluated.

With regard to the field covered by the second part of the Twenty-First Yearbook—that is, the practical use of intelligence tests—the number of books, bulletins, magazine articles, and so forth, is almost innumerable. No attempt will be made here to single out any of these discussions or reports as of unusual merit.

Books on achievement tests (1918-28). At the very beginning of this period, Monroe's *Measuring the Results of Teaching*[81] came off the press. This book was devoted to the use of tests and subsequent remedial instruction rather than to their description. Soon after 1920, a number of other books dealing with achievement tests and testing in general began to appear. Most of these were of the same general type as Monroe, DeVoss, and Kelly's *Educational Tests and Measurements.*[82] They differed from it chiefly in that since they appeared later, new tests were described. Probably only two or three of these books which were published prior to 1927 merit special mention. McCall's *How to Measure in Education*[83] appeared in 1922. It deals with the use of measurements for classifying pupils, diagnosing, teaching, evaluating the efficiency of instruction and vocational guidance, and the construction and standardization of tests. It was followed a year

[78]Thorndike, E. L., *et al. The Measurement of Intelligence.* New York: Bureau of Publications, Teachers College, Columbia University, 1927. 616 p.

[79]Bronner, A. F., *et al. A Manual of Individual Mental Tests and Testing.* Boston: Little, Brown, and Company. 1927. 287 p.

[80]Dearborn, W. F. *Intelligence Tests, Their Significance for School and Society.* Boston: Houghton, Mifflin Company, 1928. 336 p.

[81]Monroe, W. S. *Measuring the Results of Teaching.* Boston: Houghton, Mifflin Company, 1918. 297 p.

[82]*See* p. 96. The 1924 revision of this book is at present one of the two most complete texts on standardized testing in the elementary school.

[83]McCall, W. A. *How to Measure in Education.* New York: The Macmillan Company, 1922. 416 p.

later by Monroe's *Introduction to the Theory of Educational Measurements,*[84] a book of the same general type, but even more critical and advanced. In 1927 appeared the first volumes devoted to testing in the high school, Ruch and Stoddard's *Tests and Measurements in High School Instruction,*[85] and Symonds' *Measurement in Secondary Education.*[86] Both of these texts deal with tests constructed by the teacher as well as with those that have been standardized. Symonds' volume is the more inclusive of the two, having chapters on measurement of conduct, prognosis, guidance, ability grouping, and so forth, to which Ruch and Stoddard pay little or no attention. Kelley's *Interpretation of Educational Measurements,*[87] which treats only certain limited problems in the general field but offers in most cases the best critical discussions now available, also came off the press in 1927. A prominent and unusual feature of this book is that it contains ratings of practically all the existing standardized tests of much merit by a number of experts in the measurement field. The most recent volume dealing with achievement tests, by Hoke and Wilson, represents a thorough revision and enlargement of an earlier book.[88] In its general plan it resembles many others, devoting most of its chapters to tests in the various elementary and high-school subjects.

In addition to books and other writings dealing with achievement and intelligence tests, the measurement movement was aided considerably by the appearance in 1925 and later of a group of new texts dealing with statistical methods in education. Since these have been described elsewhere,[89] they are not listed here. Besides these, half or more of the books dealing with educational measurements in general, including McCall's and Monroe's, devote one or more chapters each to statistical methods.

Another publication that should be mentioned, although it is not at all of the nature of a textbook, is the *Bibliography of Educational Measurements*[90] compiled by the Bureau of Cooperative Research of Indiana University. This is by far the most complete and useful list of tests and scales in the school subjects and related fields which is

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[84]Monroe, W. S. *An Introduction to the Theory of Educational Measurements.* Boston: Houghton Mifflin Company, 1923. 364 p.

[85]Ruch, G. M. and Stoddard, G. D. *Tests and Measurements in High School Instruction.* Yonkers-on-Hudson, New York: World Book Company, 1927. 381 p.

[86]Symonds, P. M. *Measurement in Secondary Education.* New York: The Macmillan Company, 1927. 588 p.

[87]Kelley, T. L. *Interpretation of Educational Measurements.* Yonkers-on-Hudson, New York: World Book Company, 1927. 363 p.

[88]Wilson, G. M. and Hoke, K. J. *How to Measure.* New York: The Macmillan Company, 1920. 285 p. Revised and enlarged, 1928. 597 p.

[89]*See* p. 53.

[90]*Bibliography of Educational Measurements.* Bloomington, Indiana: Bureau of Cooperative Research, Indiana University, 1923. 120 p. (First revision, 1925, 147 p.; second revision, 1928, 251 p.)

generally available. The description of each test includes, among several useful facts, information as to where the test can be obtained. Intelligence tests, with a few exceptions, and those in some other closely related fields are not included.

Development of high-school tests. In the summary of the history of educational measurements down to 1918, it was stated that practically no high-school tests were then available. One of the marked characteristics of the movement since that time has been the development of such tests. Beginning in algebra, geometry, Latin, English composition, and one or two other subjects, they have been developed until now the number available in many secondary subjects runs from ten up to twenty or thirty, and in practically every one there are at least three or four. It cannot be said, however, that test development in this field is yet equal to that in the elementary field. Indeed this will probably never be true because of the somewhat different nature of the desired outcomes of elementary and high-school instruction.

As examples of recent tests dealing with high-school subjects, two outstanding series may be mentioned. The Iowa Placement Examinations,[91] the first of which appeared in 1924, consist of a number of training tests, which measure work taught in high school, and also several aptitude tests, which are intended to predict ability to carry different subjects. The subjects included are chemistry, English, modern foreign language, mathematics, and physics. Both training and aptitude tests are intended for use at the time of completing high school or entering college. The second general series referred to is the Columbia Research Bureau Tests,[92] which have appeared within the last two years. The subjects covered at present are physics, plane geometry, Spanish, German, English, French, and algebra.

Testing in institutions of higher learning. In addition to the high-school tests a number for use in colleges and universities have been developed. Some of the tests employed in such institutions are not intended exclusively for this purpose but are also adapted to high-school use.[93] Tests of this nature exist in such subjects as algebra, geometry, the various foreign languages, physics, chemistry, and so forth. In addition to these, however, there are also other more or less standardized tests for use in subjects not commonly or at all taught in secondary schools. Among the subjects with which these tests deal are philosophy, logic, education and psychology, medicine, law, and library

[91] Stoddard, G. D. "Iowa Placement Examinations," *University of Iowa Studies In Education*, Vol. 3, No. 2. Iowa City: University of Iowa, 1925. 103 p.

[92] Wood, B. D., *et al.* "Columbia Research Bureau Tests." Yonkers-on-Hudson, New York: World Book Company, 1926 and 1927. (These appear as seven separate publications.)

[93] The Columbia Research Bureau Tests are examples of such tests.

work. Not only are standardized achievement tests being employed in institutions of higher learning, but many instructors are devising objective tests for their own use. The most complete account of such tests is that given by Wood,[94] who gives lengthy examples and many data concerning their use at Columbia University.

In colleges and universities much more attention has been given to the use of standardized tests of general intelligence than to achievement tests. Dozens, probably even hundreds, of the higher institutions of this country have made some use of such tests in connection with problems of admission, educational and vocational guidance, the grouping of students for instruction, the study of failure, and similar questions. One of the best accounts of what has been done at a particular institution is that of Wood,[95] who describes in some detail the use of the *Thorndike Intelligence Examination for High School Graduates* in connection with the admission of students to Columbia University. The most comprehensive account of the use of such tests at a large number of institutions is that by MacPhail,[96] who several years ago summarized practically all of the reported studies or experiments along this line. In many higher institutions, intelligence tests have become a regular part of entrance examinations or a regular feature of some other phase of college personnel work.

Rating of school buildings. In addition to the development of achievement and intelligence tests, the last decade has witnessed considerable activity along other lines of educational measurement. Reference has already been made to the beginning of objective rating of school buildings.[97] Following this beginning, which consisted of a general score card for city school buildings, Strayer and Engelhardt also constructed and made available score cards and sets of standards for high-school buildings,[98] rural-school buildings,[99] and administration buildings.[100] Although these compose the most notable and generally-used score cards, a number of others have also appeared and received some use. Score cards are available not only for buildings but also for their maintenance and equipment. Examples of these are one by

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[94]Wood, B. D. *Measurement in Higher Education.* Yonkers-on-Hudson, New York: World Book Company, 1923, Chapters VIII to XIII.

[95]*Ibid.,* Chapters I-VII.

[96]MacPhail, A. H. *The Intelligence of College Students.* Baltimore: Warwick and York, 1924. 176 p.

[97]*See* p. 95.

[98]Strayer, G. D. and Engelhardt, N. L. *Standards for High School Buildings.* New York City: Teachers College, Columbia University, 1924. 95 p.

[99]Strayer, G. D. and Engelhardt, N. L. "Score Card for Village and Rural School Buildings of Four Teachers or Less," *Teachers College Bulletin,* Eleventh Series, No. 9, January 3, 1920. New York: Teachers College, Columbia University, 1920. 22 p.

[100]Strayer, G. D., Engelhardt, N. L., and Elsbree, W. S. *Standards for the Administration Building of a School System.* New York City: Bureau of Publications, Teachers College, Columbia University, 1927. 40 p.

Engelhardt and others for rating janitorial and engineering service,[101] and one by Anderson for rating pupils' seats and desks.[102]

Measurement of personality, character, etc. (1919 —). Another field in which a number of workers have been engaged is measurement of personality, character, temperament, and related traits. In most of the attempts along this line, rating scales have been employed which call for the rating of the subject by one or more persons upon a number of specified and weighted points. This plan, which is also commonly used in teacher rating, is not new, although it has developed considerably within the past few years. In addition to such schemes of rating, however, there are a few tests which call for pupils' responses to various sorts of exercises and situations. Among the best known of these are the Downey Will Temperament Tests.[103] These tests, which were constructed in slightly different forms for individual and for group testing, consist of subtests designed to measure such traits as speed of movement, freedom from inertia, flexibility, speed of decision, motor impulsion, assurance, resistance, motor inhibition, care for details, and coordination of impulses. Pressey is the author of a test[104] in this same general field. It consists of various lists of words, most of which evoke emotional responses to be indicated by those taking the test. Another test intended to measure emotional attitudes has been constructed by Watson.[105] This test undertakes to secure reactions to a fairly large number of statements dealing with more or less prominent international, political, economic, and social problems. The Kohs Ethical Discrimination Test[106] is typical of several tests intended to measure knowledge of ethics and morality rather than emotional reaction or actual conduct. It requires the classification and evaluation of certain actions according to their moral significance, the definition of terms, and so forth.

In addition to the tests just described, two or three rating scales may be mentioned as illustrative of the best of those now available. A very simple one is that for school habits by Cornell, Coxe, and Orleans,[107] which provides for the rating of pupils on each of nine traits,

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[101]Engelhardt, N. L., Reeves, C. E., and Womrath, G. F. *Score Card for Public School Janitorial-Engineering Service.* New York City: Bureau of Publications, Teachers College, Columbia University, 1926. 6 p.

[102]Anderson, C. A. "Tentative Score Card for Elementary School Desks and Seats," *American School Board Journal,* 69:46-47, July, 1924

[103]Downey, J. E. "The Will-Profile, A Tentative Scale for Measurement of the Volitional Pattern," *Bulletin of the University of Wyoming,* No. 3. Laramie, Wyoming: Department of Psychology, University of Wyoming, 1919. 40 p.

[104]Pressey, S. L. *Pressey X-O Tests.* Chicago: C. H. Stoelting Company, 1920. 4 p.

[105]Watson, G. B. *A Survey of Public Opinion on Some Religious and Economic Issues.* New York: Bureau of Publications, Teachers College, Columbia University, 1925. 16 p.

[106]Kohs, S. C. *Ethical Discrimination Test.* Chicago: C. H. Stoelting Company, 1922. 8 p.

[107]Cornell, E. L., Coxe, W. W., and Orleans, J. S. *Rating Scale for School Habits.* Yonkers-on-Hudson, New York: World Book Company, 1927.

attention, neatness, honesty, and so forth. Three degrees of each trait are described, but individuals may be rated at any point between these degrees. Among the more elaborate scales is one published by the California Bureau of Juvenile Research, designed for rating juvenile offenses[108] on a definite scale of points. It provides for the rating of numerous offenses, from such a slight one as playing hookey to attend a circus up to committing murder. As a further example of what has been done along the line of character rating, the work of Voelker[109] should be mentioned, although his tests are not standardized in the ordinary sense of the term. He employed a series of ten actual situations which offered opportunities for overstatement, untruthfulness, dishonesty, and so forth, in which there was apparently little chance of pupils being caught. Needless to say, the conditions were such that those giving the tests were able to detect cases of untrustworthiness in all of the qualities concerned.

"Man-to-man" rating scales. In connection with the measurement of personal traits, mention should be made of what is commonly called the "man-to-man" plan of rating. This plan had been used more or less before the World War but received its greatest use and development in connection with the rating of recruits on various traits. It appears to have originated in a seminar at the Carnegie Institute of Technology conducted by W. D. Scott, now President of Northwestern University, and is perhaps best described in a series of articles by Rugg.[110] The scale used in this plan of rating was formed by having the rater select "the best man you ever knew" and write his name at the top, "the poorest man you ever knew" and write his name at the bottom; and fill the spaces between with the names of an "average-man," a "better-than-average-man," and a "poorer-than-average-man." Numerical ratings such as 15, 12, 9, 6, and 3 were then assigned to the five steps and the scale was ready for use. Ordinarily, such a scale dealt with a single trait or perhaps a group of related traits, such as physical qualities, or leadership. When a man was rated by means of this scale, he was compared with those named on the scale and was given the rating of the one whom he most resembled, or perhaps a rating between those of two of the men named on the scale. Although this method of rating involved many subjective elements, the results

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[108]Clark, W. W. "Whittier Scale for Grading Juvenile Offenses," *California Bureau of Juvenile Research, Bulletin,* No. 11. Whittier, California: California Bureau of Juvenile Research, Whittier State School, April, 1922. 8 p.

[109]Voelker, P. F. "The Function of Ideals and Attitudes in Social Education," *Teachers College, Columbia University Contributions to Education,* No. 112. New York: Bureau of Publications, Columbia University, 1921. 126 p.

[110]Rugg, H. O. "Is the Rating of Human Character Practical?" *Journal of Educational Psychology,* 12:425-38, 485-501, November, December, 1921; 13:30-42, 81-93, January, February, 1922.

secured were found to be of distinct value, being much more reliable than ratings made with no such scale in mind. Because of these features, the "man-to-man" comparison scale has received considerable use in industry and in education.

Vocational tests. Another general field in which there has been considerable activity is that of predicting vocational or occupational aptitude. Not only have intelligence and achievement tests been used for this purpose, but also tests have been designed especially to determine the ability or probable success of individuals in various occupations. A number of such tests have appeared for engineering, clerical work, and stenography, and for many other occupations there are one or more available. As examples of workers included in this latter group may be mentioned bricklayers, chauffeurs, farmers, firemen, hospital attendants, journalists, painters, and policemen. There are also a number of tests of more or less general mechanical ability and technical information and several tests and series of tests intended for purposes of general vocational guidance. Of the various books which have dealt with vocational tests, the outstanding one is undoubtedly that of Hull.[110a] This very recent and ample volume discusses in decidedly adequate fashion both the principles and methods of aptitude testing. It is not limited to vocational aptitudes, but covers a much wider field.

Measurements of physical abilities. Physical abilities were, of course, measured long before the educational measurements movement in its present form developed, but it is only within the last few years that what may be called standardized tests of physical traits have appeared. Two examples of such tests will be given. The Winter Physical Ability Test[111] is intended primarily for the measurement of competitive activities. It consists of such exercises as knee-bending, pull-ups, balancing, and so forth, each of which is to be done under specified conditions and counts a certain number of points. Another more recent series of tests is that by Brace[112] for measuring motor ability. The tests of this series are exercises more or less similar to those of Winter, although the particular ones included are not the same.

Miscellaneous tests and scales. In addition to intelligence tests, tests dealing with the various school subjects, score cards for rating

[110a] Hull, C. L. *Aptitude Testing.* Yonkers-on-Hudson, New York: World Book Company, 1928. 535 p.

[111] "Winter Physical Ability Test," *Physical Education and Health Bulletin,* 1, Series 1924-25. Hartford, Connecticut: State Board of Education, 1924. 12 p.

[112] Brace, D. K. *Measuring Motor Ability.* New York: A. S. Barnes and Company, 1928. 138 p.

buildings and teachers, and other measuring instruments already mentioned, there are a number of miscellaneous tests and scales more or less directly applicable to public school education. There have been published, for example, tests of creative ability, of disciplinary values, of dramatic judgment, of scientific thinking ability, of learning ability, of study habits; also score cards for rating school budget practices, school records and reports, textbooks, rural schools, and so forth. In addition to tests and scales of character and moral reactions, which have already been mentioned, a number dealing more directly with religious education have been constructed. Most of these deal with the content of the Bible and other material commonly taught in Sunday school, but there are also rating scales for clergymen, for church plants, and so forth. Another purpose for which a number of scales have been developed is the rating of community and home conditions.

Acceptance of standardized tests as part of routine procedure. One of the marked tendencies of the past decade in educational measurements has been the development of rather complete testing programs in many school systems and the incorporation of such programs as an integral part of instructional and supervisory routine. Although beginnings along this line had been made prior to 1918, notably by Courtis at Detroit, it was not until later that such a program was adopted by even a single city system. Now, many if not most large city systems, of which Detroit is still probably the best example, as well as hundreds of small city and town schools, and likewise those of counties and other units, have accepted the use of standardized tests as just as much a matter of course as the use of teacher-made examinations, or any other long established procedure. Many cities, among which are Detroit, Denver, and Philadelphia, develop and publish practically all of their own tests, although some other large systems and most smaller ones use tests purchased from publishers.

State and nation-wide testing programs. Reference was made, in the first portion of this chapter, to the effect of the school survey movement upon the development and use of tests. Within the past few years, this effect has grown in two or three directions. It is now not at all uncommon for the bureau of research of a state department of education, a state university, or some other institution to promote a state-wide testing program that is not a part of a more general state survey. Frequently, from fifty to one hundred thousand pupils or even more are tested in each subject. Indeed, this movement is not even limited to states. One of the leading publishers of educational tests has during the past four years promoted annual nation-wide testing

programs involving the use of several tests each year. The last program of this sort[113] included over 500,000 pupils, every state in the Union except one being represented.

Growth of the critical attitude. Perhaps the most significant tendency in educational measurements within the last ten years is the growth of the critical attitude. In the early days of standardized tests, many superintendents, principals, teachers, and others administered tests merely because it was considered progressive to do so, or because they had a vague idea that simply giving tests and scoring papers would in some more or less mysterious way improve the efficiency of instruction and the achievement of pupils. Very commonly all that was done with the results was to announce them to the teachers, after which the papers were destroyed or stored away out of sight and all details connected with the testing forgotten. As the thoughtful leaders of the movement protested against this misuse of testing materials and waste of time and effort, and as those actually in the field came to give more careful consideration to the matter, they realized that tests had little value unless the results were carefully analyzed and followed up by the procedures for which the need was indicated. There was also an increasing realization that tests and test scores could not safely be taken at their face value, that many tests did not fulfill their announced functions, and that what was needed in many cases was a critical study and improvement of already existing tests rather than the production of new ones. No longer are well-trained administrators, supervisors, and teachers content to give almost any standardized test in the belief that it is a well-nigh perfect measuring instrument, or indeed to employ any tests at all without knowing just why they are being employed and what use is to be made of the results. In the earlier years of achievement tests, the results if used at all were commonly employed to determine the general efficiency of school systems or perhaps of buildings or teachers within a system, and little attention was paid to the scores of individual pupils. Now, however, the emphasis has changed, and the chief functions of tests are usually conceived as being to aid in the improvement of instruction, in the better classification of pupils, and in the more desirable forms of school organization. Diagnostic tests, described in the following paragraph, are receiving increasing use, and the same is true of prognostic tests by which pupils may be better guided in their school and after-school

[113] *Report of the Fourth Annual Nation-Wide Testing Survey, Project No. 1, Intelligence Testing.* Bloomington, Illinois: Public School Publishing Company, 1927-28. 32 p.

Report of the Fourth Annual Nation-Wide Testing Survey, Project No. II, English Composition. Bloomington, Illinois: Public School Publishing Company, 1927-28. 32 p.

careers. No longer are standardized tests quickly made and published. They are constructed and standardized by months, often years, of labor, and in some cases thousands of dollars are spent upon a single test before it is made available for general use. Validity and reliability are largely determined before regular publication rather than afterward. Fairly complete data as to the merit of a test are, therefore, available in most cases when the test is first announced, and this, coupled with the fact that the number of tests has become very large, makes it unnecessary for the user to choose blindly or without adequate information. Also, more refined statistical techniques are being employed and more emphasis is being placed upon interpretation.

Diagnostic tests. As a result of the growing critical attitude, one trend within the past few years has been the increasing use of diagnostic tests of achievement instead of more general ones. Increased emphasis has been placed upon diagnosis of pupils' abilities and achievements, and upon remedial instruction. In arithmetic there are tests that measure a single operation with the numbers in a single type of example, as the single digits, two-place numbers, or common fractions. In algebra, each operation and type of equation is dealt with separately. In foreign language, knowledge of declension, conjugation, vocabulary, and so forth, is tested. Similar procedures are followed in a number of other subjects. Some use in still made of survey tests yielding brief general measures of achievement, but they do not fill nearly as important a place comparatively as they did ten years or more ago.

Practice tests. Another development of the past few years has been the construction and use of what are generally called practice tests in a number of the school subjects. Although a very few series of such tests[114] were constructed rather early in the educational measurement movement, not until within the past few years have any large number of them appeared. The distinguishing feature of practice tests is that they consist of series of exercises so arranged that pupils can respond to them and score their own responses with a minimum of assistance from the teacher. It is not intended that scores made upon such tests shall be used in any way for the measurement of pupil achievement, except as such measurement is desirable in stimulating practice from time to time. Tests of this sort are more numerous in arithmetic than in any other subject, but some are also available in language and grammar, geography, history, and other subjects. In the high-school field, little has been done outside of mathematics.

[114] Probably the best known of the early practice tests are the Courtis Standard Practice Tests in Arithmetic, published by the World Book Company, Yonkers, New York, and the Studebaker Economy Practice Exercises in Arithmetic, published by Scott, Foresman and Company, New York.

The number of tests now available (1928). In concluding this discussion of educational tests and measurements, it seems appropriate to give some statistics relating to the number of tests that have appeared. The writer has endeavored to catalog all standardized and semi-standardized tests and scales that can in any sense be considered educational—that is, which have any connection with education—and believes that he has been fairly successful in compiling a complete list of those which have appeared. At present he has listed almost thirteen hundred tests and scales.[115] Many of these have never been completely standardized, and others are no longer available, but a majority of those included can be secured in some form. Of the almost thirteen hundred tests and scales referred to above, approximately one hundred fifty belong under the head of general intelligence. There are more than fifty tests in each of four school subjects: arithmetic, reading, language and grammar, and history. Other subjects in which there are more than twenty are algebra, English composition, geography, Latin, literature, physics, spelling, and handwriting. There are likewise between twenty and fifty measuring instruments in each of the following fields: general survey—that is, combined batteries of tests—personality and character, teacher rating, and vocabulary. Practically every elementary and high-school subject and many college and university subjects may be found upon the list, in addition to the abilities, traits and conditions indicated by the preceding paragraphs.

The number of tests used annually. In order to determine the approximate number of tests now being used annually in the United States, inquiries were sent to all of the leading publishers of tests and to a number of the minor ones. Answers giving the desired information were received from all of the larger publishers and from practically all of the others addressed. The best estimate that can be made from the figures furnished is that not less than thirty million copies of standardized tests and scales are now being used annually, and it is possible that if complete figures were available, the number would be nearer forty million. About 25 per cent of these are intelligence tests, and 75 per cent tests of achievement. Figures were not secured for particular tests, but it has not been uncommon for the sales of single tests in arithmetic or reading to range from five hundred thousand to a million or even more per year. Some intelligence tests also have run

[115] In tabulating tests and scales, any series of similar tests in the same subject by the same author is counted as only one. That is to say, if an author has prepared a series of reading tests, for example, embracing one test for the lower grades, one for the intermediate grades, and one for the upper grades with perhaps two or three forms of each or a series of intelligence tests including one for young children and another for adolescents, it has been counted as only one test in each case.

nearly as high. Probably the most extreme example is that of a test now several years old which was given to 10 per cent of all the elementary-school children in this country within a year and a half after it appeared.

From these figures, it will be seen that, roughly speaking, one standardized test per pupil is being used annually in the United States. The number is, however, really greater than this. Thousands of rating scales for handwriting, composition, and other subjects are being used, of which one copy for the teacher is all that is needed. Consequently, a single scale of this nature is frequently used in rating hundreds or even thousands of specimens of pupils' work. Likewise, a score card for school buildings may be used for rating many buildings; one for personality for rating many individuals, and so forth. It is, therefore, impossible to make a reliable estimate of how many specimens of pupils' work are being measured or rated according to some standardized instrument. Probably the average is not less than two or three per pupil annually. Furthermore, it may be said that at least a beginning of measurement has been made in almost every ability, characteristic, or condition that is important from the standpoint of education. It is true that in many lines the beginnings are scarcely more than tentative and have so far yielded few results of any practical value, but at least the pioneer work is being done and the way opened for more worth-while achievements later. In conclusion, it is evident that standardized educational measuring instruments have received general acceptance and have become an integral part of educational procedure and practice.

CHAPTER V

CURRICULUM RESEARCH

The problems of curriculum research. The curriculum consists of objectives, materials of instruction, and learning exercises.[1] This definition gives a cue to the central problems of curriculum research, which may be stated briefly as the determination of objectives, materials of instruction, and learning exercises. In addition to these problems of determination, there are problems of organization that are often considered to be primarily administrative, but which are not always kept separate from the former. The three major problems of organization center about: grade placement and sequence of school subjects and topics, time allotment, and pupil programs. Since these problems are commonly placed in the field of administration, the treatment of curriculum research in this chapter is confined in the main to a description of studies relating to the problems of determination.

Curriculum construction a prominent type of educational research. Even a casual survey of educational research shows that much attention is being given to the curriculum; in fact, few educational problems today are being more widely investigated. Although the curriculum has probably been a subject of educational discussion and inquiry since the time of the first schools, and several investigations, notably those under the direction of the Committee on Economy of Time of the National Society for the Study of Education,[2] had been made prior to 1918, the present wave of interest in curriculum construction began about that year. The appearance of Bobbitt's *The Curriculum*,[3] the first systematic treatise in this field, seems to have stimulated the attention of a number of educators to focus their at-

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[1]For a discussion of this definition, *see*:
Monroe, W. S. and Herriott, M. E. "Reconstruction of the Secondary-School Curriculum: Its Meaning and Trends," *University of Illinois Bulletin*, Vol. 25, No. 42, Bureau of Educational Research Bulletin No. 41. Urbana: University of Illinois, 1928, p. 10-14, 29-31.

[2]For their reports, *see* the following:
Wilson, H. B., *et al.* "Minimum Essentials in Elementary-School Subjects—Standards and Current Practices," *Fourteenth Yearbook of the National Society for the Study of Education*, Part I. Bloomington, Illinois: Public School Publishing Company, 1915. 162 p.
Wilson, H. B., *et al.* "Second Report of the Committee on Minimum Essentials in Elementary-School Subjects," *Sixteenth Yearbook of the National Society for the Study of Education*, Part I. Bloomington, Illinois: Public School Publishing Company, 1917. 204 p.
Wilson, H. B., *et al.* "Third Report of the Committee on Economy of Time in Education," *Seventeenth Yearbook of the National Society for the Study of Education*, Part I. Bloomington, Illinois: Public School Publishing Company, 1918. 134 p.
Horn, Ernest, *et al.* "Fourth Report of the Committee on Economy of Time in Education," *Eighteenth Yearbook of the National Society for the Study of Education*, Part II. Bloomington, Illinois: Public School Publishing Company, 1919. 123 p.
A brief summary of curriculum research prior to 1918 is given on p. 118 f.

[3]Bobbitt, Franklin. *The Curriculum*. Boston: Houghton, Mifflin Company, 1918. 295 p.

tention upon the curriculum. Since 1918, many books have been devoted to the subject. It is interesting to note, however, that comparatively few of these books appeared during the five years following 1918, but that beginning with 1923, they appeared in rapid succession.[4] The period 1918-22 was one of incubation. After careful search, Charters reported only fifty-six curriculum studies that had appeared in the ten-year period prior to 1923.[5] Since then the increase has been prodigious. Early in 1927, Hockett made the following statement:

> While the early objective investigations of what to teach date back about fifteen years, certainly the vast majority of the important scientific curriculum studies have appeared since 1915.
>
> There are at present hundreds of titles dealing with the curriculum and the technique of curriculum-construction, and if we include those relating to the content and organization of materials in specific subjects, the total runs into the thousands.[6]

In all probability, the development of curriculum-research techniques largely accounts for the increased activity centering around the curriculum. By 1923, fairly well-defined techniques had been developed, which enabled research workers to attack curriculum problems more effectively than formerly.

Curriculum construction and objective methods. Curriculum research is commonly interpreted to mean the employment of objective methods or at least methods that minimize the effect of the opinions and prejudices of the investigator. A large number of persons, including some curriculum experts, appear to believe that the aims or purposes of the school in general and of particular subjects may be determined by objective methods. This belief is suggested by the phrase "scientific curriculum construction." Many writers have attacked this attitude toward curriculum-making. Bode[7] in particular shows the impossibility of determining *what should be* merely by collecting factual descriptions of *what is*, or by collecting opinions. The present writers are in general agreement with this criticism, but since it is not their purpose here to evaluate the educational research of the past ten years, the limitations of the studies mentioned in the following pages will not be pointed out. The reader, however, should bear in mind that very few, if any, of these studies have eventuated

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[4]Of a list of thirty-four curriculum books, not including monographs and the like, which were available to the author of this chapter, nine appeared during the years 1918-22, fifteen appeared during 1923-24, and ten have appeared since 1924.

[5]Charters, W. W. *Curriculum Construction.* New York: The Macmillan Company, 1923, p. 113-17, 169-70.

[6]Hockett, J. A. "The Literature of Curriculum-Making: A Selected and Annotated Bibliography," *Twenty-Sixth Yearbook of the National Society for the Study of Education,* Part I. Bloomington, Illinois: Public School Publishing Company, 1927, p. 449.

Tabulation of the ninety-five different titles in Hockett's selected bibliography shows that only thirty-four of them appeared prior to 1923. Only thirteen appeared prior to 1918.

[7]Bode, B. H. *Modern Educational Theories.* New York: The Macmillan Company, 1927. 351 p.

TABLE IV
VOCABULARY STUDIES IN THE UNITED STATES PRIOR TO 1918*

Investigator	Date	Investigator	Date
Chancellor, W. E.	1910	Nicholson, Anne (Editor)	1914
Eldridge, R. C.	1911	New Orleans Public School List	1916
Ayres, L. P.	1913	Kansas City Public School List	1916
Jones, W. F.	1913	Houser, J. D.	1916
Cook, W. A. and O'Shea, M. V.	1914	Anderson, W. N.	1917

*The data for this table were taken from the following:
Ashbaugh, E. J. "The Iowa Spelling Scales: Their Derivation, Uses, and Limitations," *Journal of Educational Research Monographs*, No. 3. Bloomington, Illinois: Public School Publishing Company, 1922, p. 8.
Horn, Ernest. "A Basic Writing Vocabulary," *University of Iowa Monographs in Education*, First Series, No. 4. Iowa City: University of Iowa, 1926, p. 7.
References to source materials are given in the same monographs, p. 26-27, and p. 7, respectively.

in a curriculum. For the most part, the findings are merely facts that might be useful to a curriculum-maker, particularly as determinants of so-called minimum essentials. In a certain sense, these studies are not curriculum research, but merely fact-finding investigations relating to the curriculum.[8]

Curriculum studies prior to 1918. Curriculum investigators began their "objective" studies with the relatively more tangible subject-matter fields—spelling (vocabulary), grammar, arithmetic—and gradually broadened to include the less tangible—reading, language, history and other social studies. The tabulation of vocabulary studies presented in Table IV gives some idea of the development of such studies prior to 1918. The earliest is dated 1910. Charters has compiled a similar table for studies in language and grammar prior to 1917. Only one study is dated earlier than 1915. Three studies were published in 1915, two in 1916, and four others were unpublished when the table was prepared.[9] The earliest curriculum study in arithmetic was made in 1911 by G. M. Wilson.[10] Charters' *Curriculum Construction*, 1923, "represents the first attempt to formulate the objective methods used by curriculum builders."[11] Such a book could scarcely have been writ-

[8]Much the same point of view is expressed in the Preface to a recent book on the curriculum:
"The work [of curriculum-making] thus far has been largely of a pioneer nature. We have not yet entirely cleared the woods.
"Very few curriculum studies are complete and coherent projects."
Harap, Henry. *The Technique of Curriculum Making*. New York: The Macmillan Company, 1928. 315 p.
[9]Charters, W. W. "Minimal Essentials in Elementary Language and Grammar," *Sixteenth Yearbook of the National Society for the Study of Education*, Part I. Bloomington, Illinois: Public School Publishing Company, 1917, p. 87.
[10]This is Wilson's first study made in Connersville, Indiana. Business men were asked to give their judgment as to which topics should and which should not be included in the arithmetic course. This study is summarized in:
Wilson, G. M. "A Survey of the Social and Business Use of Arithmetic," *Sixteenth Yearbook of the National Society for the Study of Education*, Part I. Bloomington, Illinois: Public School Publishing Company, 1917, p. 128-29.
[11]Charters, W. W. *Curriculum Construction*. New York: The Macmillan Company, 1923, p. 169.

ten in 1918, for so few careful studies had been made before that date as to render the attainment of an adequate perspective improbable. The status of curriculum investigations at that time was suited much more to an empirical presentation of principles, such as Bobbitt gave in his pioneer book, *The Curriculum*, than to a summarization of studies and techniques.

Among the vocabulary studies, Ayres'[12] investigation stands out as the most significant pioneer study. He undertook "to find out whether or not there exists a fairly definite body of words so generally used in ordinary correspondence that they should form the core or basis of the spelling vocabulary taught in the lower grades of our elementary schools." By tabulating 23,629 running words of personal and business letters, he discovered 2,001 different words. He also tabulated the first word in each line of 2,000 other letters. The entire study revealed 542 words which had a frequency of use of six or more.

Among the grammar-language studies, the one by Charters and Miller[13] in Kansas City, Missouri, occupies the premier position. The purposes of the study were: "first, to determine the rules of grammar broken, and second, upon this as a basis to determine a grammar curriculum."[14] The method used involved two procedures: first, all grammatical errors made by the elementary-school children in the schoolroom or around the school buildings and heard by the teachers were supposed to be recorded; second, all papers, except dictated exercises, written in the elementary schools during one month were collected and examined for errors.

In the field of arithmetic, G. M. Wilson's[15] study of the social and business use of arithmetic stands out most prominently. The purpose was to determine the arithmetic "actually needed by social and business usage." The main part of the study involved employing sixth, seventh, and eighth-grade pupils to collect "every problem solved by either the father or the mother . . . through a period of two weeks." The problems collected, 5036 in all, were distributed according to the

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[12]Ayres, L. P. "The Spelling Vocabularies of Personal and Business Letters," *Pamphlet* No. E 126, Division of Education. New York: Russell Sage Foundation, 1913. (Out of print.) Reviewed in: Charters, *op. cit.*, p. 171.

[13]The results of this study were originally published as *Education Bulletin* No. 9, University of Missouri. For a résumé of this and closely related studies, *see:*
Charters, W. W. "Minimal Essentials in Elementary Language and Grammar," *Sixteenth Yearbook of the National Society for the Study of Education*, Part I. Bloomington, Illinois: Public School Publishing Company, 1917, p. 85-110.

[14]*Ibid.*, p. 100.

[15]Wilson, G. M. *What Arithmetic Shall We Teach?* Boston: Houghton Mifflin Company, 1926, p. 7-9, 30-51, 58-63.

occupation of the one who worked them and were analyzed for the arithmetical operations and life situations[16] involved.

In the social studies, the most significant pioneer study is the investigation of the content of seventh and eighth-grade American history by Bagley and Rugg.[17] The purpose of the study was "to present facts and raise problems rather than to set forth conclusions or outline solutions." The facts presented were "the present [1906-12] content of this basic historical instruction and the significant changes that this content has undergone in the past half century." The technique used was as follows: twenty-three American history texts ranging over the period 1865 to 1915 and intended for use in the seventh and eighth grades were selected in a "random" fashion and the number of words in each computed. The books were then analyzed by graduate students. From the resulting data, the following things were noted with respect to each of several periods or epochs of history: the topics and names common to all of the books, those common to at least three-fourths of the books, those common to at least one-half of them, and finally, the amount of space devoted to each topic. These data were carefully checked in order to reduce the error that is inevitable when many persons collaborate in work of this sort.

A second pioneer investigation in the social-studies field involved the use of a technique that has recently been applied on a large scale. Horn[18] set out with the hypothesis "that the chief purpose of teaching history in the elementary school is to make pupils more intelligent with respect to the more crucial activities, conditions and problems of present-day life."[19] Heads of the departments of political science, sociology, and economics made lists of such problems and of books that they thought furnished the best treatment of each. One book for each problem was finally chosen for analysis. Books of a clearly historical character were not used. The analysis was carried on in a manner similar to the method used by Bagley and Rugg.

The reader has possibly noted that most of the studies mentioned in the preceding pages were reported in part or wholly in the Fourteenth and Sixteenth Yearbooks of the National Society for the Study of Education. The Committee on Economy of Time of this society was the

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[16]That is, one part of the analysis was on the basis of the activities involved, buying, selling, and so forth, or of the commodities involved, stocks, bonds, groceries, corn, hogs, and so forth. Wilson called such situations "subject matter."

[17]Bagley, W. C. and Rugg, H. O. "The Content of American History as Taught in the Seventh and Eighth Grades," *University of Illinois Bulletin*, Vol. 13, No. 51, School of Education Bulletin No. 16. Urbana: University of Illinois, 1916. 59 p. (Out of print.)

[18]Horn, Ernest. "Possible Defects in the Present Content of American History as Taught in the Schools," *Sixteenth Yearbook of the National Society for the Study of Education*, Part I. Bloomington, Illinois: Public School Publishing Company, 1917, p. 156-72.

[19]*Ibid.*, p. 156. Printed in italics in original.

outstanding agency organized for the purposes of curriculum research during the period and furnished the stimulus for most of the investigations. One other type of curriculum research carried on under the direction of this Committee should be mentioned. Holmes[20] reported a study of time-allotment to and grade-placement of school subjects. The method used was simply to collect official tables and tabulate the data.

To summarize, by 1918, curriculum studies of two types were under way: studies designed to ascertain the status of the existing curriculum, and investigations designed to determine what should be the nature of the curriculum. For the first purpose, the techniques involved analysis of existing materials of instruction and compilation of time-allotment and grade-placement data. For the second purpose, the techniques involved analysis of activities and records of activities of both children and adults, attention being given either to use or to difficulties (errors).

Types of curriculum research. As has been previously mentioned, fairly well-defined techniques of curriculum research had been developed by 1923. Some are adapted to more than one kind of approach to the problems of the curriculum, but in the main each has been closely identified with one type of curriculum research. For instance, the questionnaire technique is used both in making activity analyses and in determining consensus of opinion. The interview technique has been limited chiefly to use in activity analyses. The description of techniques and of approaches to curriculum problems can best be accomplished by describing them together. Most curriculum investigations may be classified, according to the approach made, under one of five rubrics:[21]

A. Activity analysis
B. Determination of consensus of opinion
C. Determination of consensus of school practice
D. Analysis of textbooks
E. Determination of pupil reactions

In addition, a few outstanding investigations have been made which cannot be classified readily under any one of these rubrics.

A. Activity analysis. In a relatively simple way,[22] both Bobbitt and the Commission on the Reorganization of Secondary Education

[20]Holmes, H. W., *et al.* "Time Distributions by Subjects and Grades in Representative Cities," *Fourteenth Yearbook of the National Society for the Study of Education,* Part I. Bloomington, Illinois: Public School Publishing Company, 1917, p. 21-27.

[21]Although these five rubrics overlap somewhat, they provide a helpful basis for a description of curriculum research.

[22]The technique employed in making such analyses is simple in that it does not employ highly developed statistical and related procedures. However, the thinking may be of the highest order.

used an activity-analysis technique in formulating their well-known classifications of educational objectives. Both analyzed "the broad range of human experience into major fields" by observing the activities of life. The Commission arrived at a classification of seven rubrics;[23] Bobbitt obtained a list of ten.[24]

When the analytical procedure is carried to the point where the units are minute and closely interrelated, the technique assumes many different aspects intended to secure greater accuracy, objectivity, and reliability. Charters describes four techniques of "activity analysis":

1. "Introspection," in which a participant in the major activity lists all of the subsidiary activities or duties of which he can think;
2. "Working on the job," which is a modified form of introspection;
3. "Interviewing," in which a trained interviewer asks the participant in the major activity to give a list of his duties;
4. "Questionnaire," which is essentially a type of interviewing.[25]

Examination of activity-analysis studies discloses two other methods:

5. Observing workers and noting the particular duties they perform;
6. Analyzing records of activities performed.

Each of these activity-analysis techniques is described somewhat more fully in the following pages, and at least one illustration is given for each. An entire investigation, however, is seldom confined to one technique. A combination of two or more of them produces better results.

1. Introspection. Introspection, as the name signifies, is an activity-analysis technique that can be employed effectively only by one who is already familiar with the duties of the activity to be analyzed. If one who had worked at the machinist's trade were analyzing the duties of a machinist, it would be natural for him to begin by listing all of the specific duties he could recall. This might be supplemented later by other techniques, but nevertheless, it is the initial technique for the experienced worker. Introspection was used by Lundin,[26] who set out to construct "a curriculum in horticulture for the high school." He accepted the position that the steps of curriculum construction are: (1) determination of conduct objectives; that is, the activities for which the student is to be trained; (2) determination of control objectives, or the abilities required for performance of the duties enumerated as conduct objectives: (3) determination of learning activities

[23]"Cardinal Principles of Secondary Education," *U. S. Bureau of Education Bulletin*, 1918, No. 35. Washington: Government Printing Office, 1918, p. 9-11.

[24]Bobbitt, Franklin. *How to Make a Curriculum.* Boston: Houghton Mifflin Company, 1924, p. 7-31, particularly p. 8-9.

[25]Charters, W. W. *Curriculum Construction.* New York: The Macmillan Company, 1923, p. 38.

[26]Monroe, W. S., Hindman, D. A., and Lundin, R. S. "Two Illustrations of Curriculum Construction," *University of Illinois Bulletin*, Vol. 25, No. 26, Bureau of Educational Research Bulletin No. 39. Urbana: University of Illinois, 1928, p. 33-53.

which, if engaged in, will produce these abilities; (4) determination of the requisite learning exercises; and (5) determination of the materials of instruction that will form an adequate basis for the learning exercises and learning activities. Having acted as a county agricultural agent for six years, as well as having been a farmer, Lundin was in a position to make an analysis by introspection of the duties of a horticulturist. However, his introspection was made on the basis of carefully worked-out principles and was checked by interviews with teachers of vocational agriculture, members of the department of horticulture of the University of Illinois, and students in courses in horticulture.

2. Working on the job. A curriculum-maker who is not familiar with the activity for which a curriculum is being made may deliberately engage in the duties of the job and in this way make an analysis of the job while gaining an acquaintance with it. This technique, which is relatively rare, is well illustrated by the work of C. A. Gilkerson, Supervisor of Training and Education of the Public Service Company of Northern Illinois, in developing job manuals. Students working on the jobs to be analyzed gathered the material for the manuals. The student "not only learns the work and gets a very good understanding of the function of the department but gathers material for the manual right off the job."[27]

In a more academic setting, this working-on-the-job technique was employed by Reagan,[28] who set out "to determine what particular items of mathematics are needed in solving high school physics problems." He solved all of the problems requiring quantitative treatment and yielding quantitative results, exclusive of the review list in the Appendix, in Millikan and Gale's *A First Course in Physics.* The solutions were analyzed to determine what knowledge and skills acquired in the study of arithmetic, algebra, and geometry are needed to solve the problems. "No fact, principle or process treated in the body of the text was tabulated;" hence, all the mathematical knowledge tabulated "may be regarded as presupposed equipment of the pupil." From this analysis, Reagan derived the outlines of a curriculum in mathematics which would furnish an adequate basis for this particular physics text.

3. Interviewing. In employing this technique, the investigator "interviews" a person on the job, asking him to give a list of the duties performed. After the list has been recorded, it may be returned to the worker for correction and additions. Usually, several workers are in-

[27]Quoted from a letter by Mr. Gilkerson.

[28]Reagan, G. W. "The Mathematics Involved in Solving High School Physics Problems," *School Science and Mathematics,* 25: 292-99, March, 1925.

terviewed, and a composite list of duties is obtained. Charters and Whitley[29] undertook "to ascertain what duties are actually performed on the job by secretarial workers," from which the investigators believed could be derived "an exact formulation of the fundamental subjects, such as accounting, economics, and so on, upon which the efficient performance of these duties is based."[30] The procedure for obtaining the list of duties was as follows: Trained workers, using a series of carefully prepared questions, interviewed 125 secretaries employed by leaders in the major professions and types of business, as classified in the Federal Census. Eight hundred seventy-one duties were discovered. After these had been ascertained, the interview technique was supplemented by a questionnaire in which the 871 duties were submitted to secretaries and stenographers for checking. The relative frequency of the 871 duties was ascertained from a tabulation of 715 checked duty lists. Relative frequency of duties was determined not only for the total group of 715 secretaries and stenographers, but also for each of fifteen groups into which the 715 were divided according to the profession or business of the employers.

4. Questionnaire. Use of the questionnaire is essentially a type of interviewing in which the range of the investigation is extended greatly without increased expenditure of energy.[31] If the questionnaire asks for an enumeration of duties, it differs from the interview only in that the inquiry is conducted at long range and without the advantages of personal contact of interviewer and worker. If the questionnaire lists duties to be checked, it takes on more of the characteristics of introspection conditioned by interviewing.

Fuller[32] undertook "to determine what problems and processes would be involved in a manual arts course, based upon work which is done or may be done around the home by a handy man with a common carpenter's or painter's tools." He developed a questionnaire from data obtained by means of fifty interviews and the inspection of twelve houses.[33] This questionnaire, containing a list of 328 jobs, was answered by 430 high-school and college students who were assisted by their parents or landladies. The student underscored each job that was in need of being done around the house in which he lived, or could

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[29]Charters, W. W. and Whitley, I. B. "Summary of Report on Analysis of Secretarial Duties and Traits," *Service Bulletin,* No. 1. New York: National Junior Personnel Service, Inc., 1924. 62 p.

[30]*Ibid.,* p. 11.

[31]For a discussion of the limitations of the questionnaire as a job-analysis technique, *see:*

Charters, W. W. *Curriculum Construction.* New York: The Macmillan Company, 1923, p. 133-34.

[32]Fuller, L. R. "Manual Arts Based on Home Repair," *Journal of Educational Research,* 3 : 173-79, March, 1921.

[33]The techniques for developing questionnaires which embody an analysis of jobs are identical with the techniques of activity-analysis which are described in this section.

be recalled as having been done in that or any other house with which the student, his parents, or landlady had been acquainted. Jobs not on the list were to be added from a summary of the information obtained, the tool processes involved were "drawn off," and the frequency of their use in home repair and construction was ascertained. These data were used as a basis for evaluating the common manual-arts course. This analysis could also be made one basis for revising an established course, or for constructing a new one.

5. Observing workers. In lieu of either interviewing or working on the job, the investigator may simply observe the workers and note the duties they perform. This is illustrated in the study by Strong,[34] who undertook to analyze the job of the manager in industry. Although several techniques were employed, one of the most prominent appears to have been the observation of executives at work:

> Our job analyses contained six parts. First we listed the *duties* of the position—what the executive did. Second, we noted the *essential qualifications.* . . . Third, we added the *qualifications not essential but of value.* Here were recorded such groups of information as the executive himself pointed out he ought to possess to handle his job better or such as appeared to the investigator to be of value to the executive. . . . Fourth, the *route to the job* the official had himself pursued. Fifth, the *probable line of promotion* upwards. . . . Sixth, *recommendations and notes of any sort.*[35]

6. Analyzing records of activities. Wherever records of activities performed are available, they may be analyzed for the purpose of obtaining a list of specific duties. Charters[36] wished to discover what arithmetical operations were of importance for salespeople. He attacked the problem by selecting at random 7,337 charge checks (records of purchase transactions in which the goods are charged to customers' accounts) and analyzing them for the addition and multiplication combinations involved. In determining the subtraction operations, he examined 4,304 cash checks. The division operations were determined from 7,337 charge checks supplemented by 2,458 sales checks.

This study by Charters, however, is hardly typical of the record-analysis technique, for printed records have probably been used more often than such records as sales slips. Most analyses of printed records have been made from one of two points of view—either to ascertain the "activities of man's life," or to determine the activities in which readers engage. Several studies have been reported recently in which

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[34]Strong, E. K., Jr. "Job Analysis of the Manager of Industry," *School and Society,* 13: 456-62, April 16, 1921.

[35]*Ibid.,* p. 458.
The observation-of-workers technique is made somewhat more explicit in the description of this investigation given by Charters in *Curriculum Construction,* p. 292-97.

[36]Charters, W. W. *Curriculum Construction.* New York: The Macmillan Company, 1923, p. 231-36.

elaborate analyses of records have been made from the former point of view. For example, the *Reader's Guide to Periodical Literature* for the three-year period of 1919-21 was analyzed,[37] the purpose being "to use the eleven thousand specific topics appearing in the Index in order to discover the major activities of man's life and, in some degree, the subordinate fields into which the major fields naturally divide themselves."[38] The major assumption involved in making this analysis is stated as follows:

> In magazines, bulletins, and proceedings of organizations, there is an endless flood of printed materials which constitute a continuous mirror of the world's action and of the things and relations with which that action deals. The *Reader's Guide to Periodical Literature* provides, among other things, a subject classification of the matters treated in somewhat more than one hundred of the more serious of these publications. This composite index therefore ought to show with considerable accuracy what man is thinking about, what he is dealing with, and what activities he is performing.[39]

A card was made for each of the eleven thousand topics appearing in the Index, and the number of articles bearing on each topic noted. The cards were then sorted into piles, "one pile for each general field of human action or interest that seemed to be indicated or called for by the cards themselves." This was done several times until a seemingly satisfactory grouping was achieved. The result was a list of 46 topics with a range of from 9,920 articles on the topic of government down to 89 for mathematics. The total frequency for the 46 topics was 63,148. Each of the topics was also further divided into sub-topics; for instance, of the 9,920 articles on government, 3,627 pertained to "military and naval affairs and war."

The general conclusion as to the results of the study were stated as follows:

> The foregoing tables[40] go a long way toward showing the things which function in human life *today*. They do not show what functioned long ago. They cannot, therefore, be used to justify survivals from ancient days. They do not show, nor do they attempt to show, what educationists, whether old-fashioned or new-fashioned, think the world should be concerned with. They show what it is concerned with.[41]

Two of the better-known analyses of printed records made for the purpose of determining the activities in which readers engage are Washburne's investigation of the basic facts needed from history and geography,[42] and the study of biology in the public press by Finley and

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[37]Bobbitt, Franklin, *et al.* "Curriculum Investigations," *Supplementary Educational Monographs*, No. 31. Chicago: University of Chicago, 1926, p. 7-22.
[38]*Ibid.*, p. 8.
[39]*Ibid.*, p. 7.
[40]Tables given in Bobbitt's monograph.
[41]*Ibid.*, p. 20.
[42]Washburne, C. W. "Basic Facts Needed in History and Geography; A Statistical Investigation," *Twenty-Second Yearbook of the National Society for the Study of Education*, Part II. Bloomington, Illinois: Public School Publishing Company, 1923, p. 216-33.

Caldwell.[43] The analytical procedures of the two studies differ in certain details, but the general plan may be illustrated by a description of the latter. Finley and Caldwell undertook to determine the character and the extent of biological material appearing in the public press. "Representative daily newspapers were collected, seventeen full months' issues in all. Four hundred and ninety-two different papers were collected, these having an estimated total of thirteen thousand seven hundred ninety-six pages. From these pages, a total of three thousand sixty-one biological articles were secured."[44] These articles were classified under eight main topics, of which four included more than 90 per cent of the articles. The investigators were of the opinion that biological instruction should train pupils to read such articles intelligently.

B. Determination of consensus of opinion. Curriculum construction on the basis of consensus of opinion is of long standing, but the systematic procedures now used for securing expressions of opinions are of comparatively recent origin. The following three studies by Bobbitt, Nietz, and Rugg illustrate different techniques employed in the consensus-of-opinion approach to curriculum problems.

Over a period of twelve years, several hundred objectives were collected by Bobbitt[45] from some fifteen hundred members of graduate classes in "The Curriculum." The tentative list was submitted to "citizens, school officials, and teachers of Los Angeles." The critical examination made by some twelve hundred high-school teachers formed the chief basis of revision. The list finally accepted represented a consensus of their opinions. The method just sketched is a perfectly straightforward way of securing a consensus of opinion. More recently, Bobbitt has directed certain investigations[46] which have gone somewhat indirectly about the task. In one of these studies,[47] Nietz attempted to determine a consensus of the opinions of leaders of current thought in regard to the duties and traits of a good citizen—this being conceived as a first step in the formulation of the citizenship curriculum. He combined two techniques: analysis of writings (newspaper editorials and special magazine articles on citizenship) and the interview. The result was a list of 1,243 civic traits and activities

[43] Finley, C. W. and Caldwell, O. W. *Biology in the Public Press.* New York: The Lincoln School of Teachers College, Columbia University, 1923. 151 p.

[44] *Ibid.*, p. 142.

[45] Bobbitt, Franklin. "Curriculum-Making in Los Angeles," *Supplementary Educational Monographs,* No. 20. Chicago: University of Chicago, 1922. 106 p. (Out of print.)
See also:
Bobbitt, Franklin. *How to Make a Curriculum.* Boston: Houghton Mifflin Company, 1924. 292 p.

[46] Bobbitt, Franklin, *et al.* "Curriculum Investigations," *Supplementary Educational Monographs,* No. 31. Chicago: University of Chicago, 1926. 204 p.

[47] *Ibid.*, p. 54-68.

classified under 12 main divisions and 39 subdivisions. The list of traits and activities is very similar to the sort of list that would be obtained by activity analysis, but in reality it is a compilation of what recognized leaders think should be the traits and activities rather than the actual traits and activities. Of course, if it were possible to secure lists in both ways, as it is in some instances, the two would supplement and reinforce each other.

In an attempt to discover the insistent problems and issues of modern social life, Rugg has employed the consensus-of-opinion technique in much the same form as that just reported.[48] He decided that no group of people was so "well equipped to state the issues" as the group of writers and publicists he calls "frontier thinkers," such as Boyce, Frances Kellor, Gibbons, and Commons. In order to secure the consensus of their opinions as to the insistent problems and issues, he canvassed books written by several scores of such frontier thinkers. This method was thought to be superior to the use of question blanks which such authorities might have been asked to fill out. However, the books were selected on the basis of their quality, as judged by reviewers and specialists, rather than because they were written by frontier thinkers.

C. Determination of consensus of school practice. One of the earliest analyses of curriculum practices was Holmes'[49] study of time allotment and grade placement of subjects. Since then numerous studies have been made, some investigators attempting to ascertain current practice, others making historical studies. Of the many studies which have attempted an analysis of school practice, three published by the University of Chicago are outstanding: the investigations by Stout,[50] Glass,[51] and Counts.[52] Stout's purpose was "to trace the development of high-school curricula in the North Central states from

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[48]For a description of Rugg's procedure, *see:*

Rugg, H. O. "Problems of Contemporary Life as the basis for Curriculum-Making in the Social Studies," *Twenty-Second Yearbook of the National Society for the Study of Education,* Part II. Bloomington, Illinois: Public School Publishing Company, 1923, p. 260-73. *Also,*

Hockett, J. A. "A Determination of the Major Social Problems of American Life," *Teachers College, Columbia University Contributions to Education,* No. 281. New York: Bureau of Publications, Columbia University, 1927. 101 p.

This technique was used in a somewhat more elementary form by Horn several years earlier, but Rugg's more recent work has brought it into prominence. *See:*

Horn, Ernest. "Possible Defects in the Present Content of American History as Taught in the Schools," *Sixteenth Yearbook of the National Society for the Study of Education,* Part I. Bloomington, Illinois: Public School Publishing Company, 1917, p. 156-72.

[49]*See* p. 121.

[50]Stout, J. E. "The Development of High-School Curricula in the North Central States from 1860 to 1918," *Supplementary Educational Monographs,* No. 15. Chicago: University of Chicago, 1921. 322 p.

[51]Glass, J. M. "Curriculum Practices in the Junior High Schools and Grades 5 and 6," *Supplementary Educational Monographs,* No. 25. Chicago: University of Chicago, 1924. 181 p.

[52]Counts, G. S. "The Senior High School Curriculum," *Supplementary Educational Monographs,* No. 29. Chicago: University of Chicago, 1926. 160 p.

1860 to 1900." Although he cited a few authorities, his "tabulations and discussions [were] for the most part based upon data secured from original sources, . . . chiefly published courses of study and textbooks." The courses of study selected were in Stout's judgment fairly representative of the schools of the region during the period studied. Textbooks were "selected on the basis of their general use as shown by lists displayed in published courses of study."[53]
After these sources were determined, the titles of curricula and names of subjects appearing in the courses of study were tabulated. This procedure was supplemented by careful inspection and comparison of the content of textbooks, but there was no attempt to employ statistical methods.

Glass and Counts studied existing curriculum practices rather than trends of previous practices over a period in which trends could be identified. Much the same technique was employed by both Glass and Counts. A few cities (fourteen and fifteen, respectively) were selected for intensive study. Where possible, Counts limited his study to one high school in each city. Most of the data were secured by means of carefully prepared questionnaires. Counts followed up the questionnaires by interviews and by classroom observation. The curricula and subject offerings were ascertained, grade placement and time allotment determined, and finally, the time emphasis on topics or teaching units of subjects was also ascertained. Glass carried this last part of the analysis farther than did Counts.

D. Textbook analysis. Textbook analysis is one of the older "objective" approaches to curriculum problems. It was used by Bagley and Rugg in 1916.[54] A bibliography of textbook-analysis studies, published in 1921,[55] includes 31 titles of articles and theses, all but one of which appeared during the years 1916-20. The analysis of textbooks has varied from identifying the major topics treated and counting the number of pages devoted to each, to classifying the content under an elaborate scheme designed for the purpose.

Monroe and Clark[56] recently undertook "to determine the nature and extent of the learning exercises provided by texts in arithmetic." Their examination of problems provided in arithmetic texts revealed 333 problem types. These were used as a basis for analyzing the sec-

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[53]Stout, *op. cit.*, Preface.
[54]*See* p. 120.
[55]Doherty, Margaret. "The Selection of Textbooks," *Journal of Educational Research*, 3: 68-70, January, 1921.
[56]Monroe, W. S. and Clark, J. A. "The Teacher's Responsibility for Devising Learning Exercises in Arithmetic," *University of Illinois Bulletin*, Vol. 23, No. 41, Bureau of Educational Research Bulletin No. 31. Urbana: University of Illinois, 1926. 92 p.

ond and third books of ten three-book series of arithmetics. Williams[57] undertook to discover the amount of mathematical knowledge needed to handle freshman chemistry, using a particular text. Seven standards or principles were set up as guides to the study. A careful examination was made of the expository portion of the text "to determine what words or expressions were used which were distinctly mathematical or which implied mathematics. All others were omitted. These were then classified and their frequency determined."[58]

E. Determination of pupil reactions. Pupil interests, pupil needs, and closely related factors have been more or less prominent in educational thinking during the past decade, and their influence is apparent in certain curriculum studies. The first of the following investigations is an attempt to ascertain the appropriateness of materials of instruction on the basis of pupil interest; the second is an attempt to ascertain appropriateness on the basis of the ability of pupils to learn certain content; the third is an attempt to develop a curriculum directly from the normal activities and interests of children.

Washburne[59] attacked the problem of grade-placement of reading materials by ascertaining the reactions of children to books. Over one hundred thousand ballots were cast, by means of which approximately thirty-six thousand children indicated whether they liked or disliked books that they read. The validity of the ballot-records and the consistency of the pupils in voting were checked and found to be satisfactory. A list of seven hundred titles was compiled, with the following facts recorded for each: the number of boys and of girls who had read and reported on the book, the per cent liking it, its interest value, the median age of the boys and of the girls who reported, the median reading grade of the pupils who liked it, the school grade of those who liked it, the number of cities from which data were secured, and an index of popularity. The books were also classified according to ages as well as school grades.[60]

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[57]Williams, L. W. "The Mathematics Needed in Freshman Chemistry." *School Science and Mathematics*, 21: 654-65, October, 1921.
Summarized in:
Charters, W. W. *Curriculum Construction.* New York: The Macmillan Company, 1923, p. 238-41.

[58]Williams, *op. cit.*, p. 654.

[59]Washburne, C. W. "A Grade-Placement Curriculum Investigation," *Journal of Educational Research*, 13: 284-92, April, 1926.
Washburne, C. W. and Vogel, Mabel. "Books Children Like," *Journal of the National Education Association*, 15: 27-28, January, 1926.

[60]In continuing this investigation, those books which have the greatest interest value and have a well defined grade-placement are being analyzed to determine their characteristics: appearance, form, and content. A refined book-analysis technique is involved which is not described in detail by Washburne.

Webb[61] made a study of the adaptability of general science materials to pupils of the fifth, sixth, seventh, and eighth grades. After making an analysis of the content of eighteen general-science textbooks, twenty-five important and characteristic topics were selected from each of the five principal sciences represented in these books: physics, physiography, biology, physiology-hygiene, and chemistry. For each topic, tests were designed to measure the knowledge of the topic already possessed by the pupils, the ability of pupils to understand a simple presentation of the topic, and their ability to apply the principles of the topic to another problem such as might be propounded by the teacher in ordinary class discussion. In this way, Webb arrived at conclusions relative to the adaptability of the various science materials for the different school levels. For example, he decided that astronomy, botany, chemistry, and zoology are not suitable for instruction below the sixth grade, and that chemistry is of doubtful value in any of the elementary-school grades.

Meriam[62] developed a curriculum from the "out-of-school interests and activities of children." At first the school work was very informal, and although an organization of a sort did develop, it always remained very flexible and was never "allowed to crystallize in a fixed organization."[63] The unique characteristics of Meriam's approach were: development of materials and activities directly from the pupil's out-of-school interests and activities, and organization determined on the basis of pupil reactions. This experiment is a whole-hearted application of a pupil-reaction approach to the problems of the curriculum compared to which the Washburne and Webb studies are only fragmentary. Much the same procedure was followed by Collings in his experimental rural school.[64]

F. Miscellaneous. Two studies are summarized under the caption "Miscellaneous" because they cannot be said to typify approaches that have been made by any considerable number of investigators. Harap[65] approaches the curriculum through an analysis of current American

[61]Webb, H. A. "General Science Instruction in the Grades," *George Peabody College for Teachers Contributions to Education*, No. 4. Nashville, Tennessee: George Peabody College for Teachers, 1921, p. 41-105.
Summarized in:
Curtis, F. D. *Investigations in the Teaching of Science.* Philadelphia: P. Blakiston's Son and Company, 1926, p. 187-97.
[62]Meriam, J. L. *Child Life and the Curriculum.* Yonkers-on-Hudson, New York: World Book Company, 1920. 538 p.
[63]*Ibid.*, p. 14.
[64]Collings, Ellsworth. *An Experiment with a Project Curriculum.* New York: The Macmillan Company, 1923. 346 p.
[65]Harap, Henry. *The Education of the Consumer.* New York: The Macmillan Company, 1924. 360 p.

economic life. He enumerates "five factors which condition the curriculum":

1. The fundamental elements of effective social life
2. The nature of the learner
3. The laws of learning
4. The nature of the teacher
5. The attitude, resources, and limitations of the community

He conceives that determination of the first set of factors is the task of specialists who determine curriculum objectives and furnish the sociological basis of school activities; that is, educational sociologists. Determination of the second and third factors is the task of the psychologists. The fourth and fifth are allotted to the school administrators. In relation to this five-fold cooperative task, Harap thought of his investigation as an attack upon the first phase:

> It is the purpose of this study to discover the objectives of education for American economic life with special reference to the consumption of food, shelter, fuel, and clothing. The conclusions of this inquiry will be termed *educational objectives* because they are the habits, skills, knowledge, or attitudes which should be achieved by educational activity.[66]

The procedure is in general as follows: first, to ascertain "the present economic habits of the people of our nation"; second, to "compare these habits with standards of good living which have scientific support"; and third, to discover by means of the foregoing procedure the habits that "are utterly bad and should be discontinued," those that "are poor and should be improved," and those "good habits thus far neglected which should be developed." The method used to ascertain "present economic habits" was to examine "quantitative data describing actual life conditions." Evidence was gathered from such sources as the Census Reports, United States Bureau of Labor Statistics, and reports of independent studies. "Standards of good living" were obtained from several sources. Nutritive standards were taken from those worked out by the United States Department of Agriculture and budgetary standards from the work of economists such as W. F. Ogburn. The standards and the original data on habits were selected with a view to making comparison possible. In order to accomplish this, they frequently had to be revamped. Once the comparison was made, the objectives were fairly obvious. However, the objectives obtained were stated almost wholly in terms of conduct rather than in terms of "habits, skills, knowledge," and "attitudes." Except for "to know" objectives, the following relative to the selection of food are representative: "To consume more vegetables and fruit by weight,"

[66]Harap, *op. cit.*, p. 4.

"To spend less money for meat," "To eat more potatoes," "To select food with an eye to its dietary functions."[67] Harap called attention to the fact that the statements were "objectives and not school activities. In some cases the school activities are easily recognizable and often even coincide with the objectives. In other cases the school activities are only remotely suggested by the objectives."[68]

Bruner and Stratemeyer[69] have begun an investigation to determine the "actual status" of present curriculum practices through an examination of courses of study. The first report made of their study deals almost exclusively with the technique employed in rating eight hundred to a thousand courses of study in each of the subject-matter fields of the elementary school. One hundred twenty-one judges rated the courses of study, using criteria for evaluating them which had been developed from an examination of a large number of courses of study. These criteria were formulated as rating scales, the scales differing somewhat for each of the various types of courses of study. The chief contributions of the study thus far are: criteria for evaluating courses of study, a list of courses of study which most nearly conform to the "best points of the criteria," and a few tentative statements of major trends in elementary education.

Extent of curriculum research during the past ten years. It is impossible to make definite statements regarding the amount of curriculum research conducted during the past decade or of the relative prominence of the curriculum as compared with other educational problems. However, a few facts may be cited as evidence of the widespread interest that has prevailed and of the vast amount of research that has been carried on. In the first place, an enumeration of prominent educators whose names are closely linked with curriculum research is a good indication of the importance that has been attached to the problems involved; such names as Bobbitt, Bonser, Charters, Counts, Horn, McMurry, Meriam, Rugg, Stout, and Uhl come to mind at once. Some indication of the large number of articles, monographs, books, and so forth published during this period was given at the first of this chapter. A somewhat more precise idea may be had from an inspection of the extensive list of reports of educational research during the past ten years which appears in Part II of this bulletin. Of

[67] Harap, *op. cit.*, p. 288.
[68] *Ibid.*, p. 287.
[69] Stratemeyer, F. B. and Bruner, H. B. "Rating Elementary School Courses of Study," *Studies of the Bureau of Curriculum Research of Teachers College, Columbia University Bulletin*, No. 1. New York: Bureau of Publications, Teachers College, Columbia University, 1926. 193 p.

the 3,714 titles, 230 have been classified by the compilers as curriculum studies. This number may be compared with 233 for intelligence testing and 71 for ability grouping. Both volumes of the *Twenty-Sixth Yearbook of the National Society for the Study of Education*[70] were devoted to "an inventory and appraisal of curriculum-making in American schools—past and present." These are undoubtedly epoch-making volumes in the long series of yearbooks of this Society. All except the first of the six yearbooks of the Department of Superintendence of the National Education Association have been devoted to either the elementary or secondary-school curriculum.[71] Perhaps the most important influence of the Commission on the Curriculum of the Department of Superintendence which has made its reports through these yearbooks has been the stimulation of "teachers, principals, supervisors, superintendents of schools, and college specialists" to work on problems of the curriculum. They inaugurated a "Cooperative Plan of Curriculum Revision in which three hundred school systems and colleges and universities" participated. No doubt many persons would hesitate to classify as research all work done in this and related undertakings; but needless to say, it is indicative of widespread interest and extended activity. Three issues, one of them a combination of two numbers, of the Research Bulletin of the National Education Association[72] have been devoted to summarizing and chronicling the work being done on the curriculum throughout the nation. In the second of these two issues there was given a list of 889 courses of study published between January 1, 1923, and November, 1925. One has

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[70]Rugg, H. O., *et al.* "The Foundations and Technique of Curriculum-Making," *Twenty-Sixth Yearbook of the National Society for the Study of Education,* Parts I, II. Bloomington, Illinois: Public School Publishing Company, 1926. 475 p., 236 p.

[71]Jones, R. G., *et al.* "The Elementary School Curriculum," *Second Yearbook of the Department of Superintendence.* Washington: Department of Superintendence of the National Education Association, 1924. 296 p.

Broome, E. C., *et al.* "Research in Constructing the Elementary School Curriculum," *Third Yearbook of the Department of Superintendence.* Washington: Department of Superintendence of the National Education Association, 1925. 405 p.

Broome, E. C., *et al.* "The Nation at Work on the Public School Curriculum," *Fourth Yearbook of the Department of Superintendence.* Washington: Department of Superintendence of the National Education Association, 1926. 520 p.

Broome, E. C., *et al.* "The Junior High School Curriculum," *Fifth Yearbook of the Department of Superintendence.* Washington: Department of Superintendence of the National Education Association, 1927. 562 p.

Broome, E. C., *et al.* "The Development of the High School Curriculum," *Sixth Yearbook of the Department of Superintendence.* Washington: Department of Superintendence of the National Education Association, 1928. 584 p.

[72]"Facts on the Public School Curriculum," *Research Bulletin of the National Education Association,* Vol. 1, No. 5. Washington: Research Division of the National Education Association, 1923, p. 310-50.

"Keeping Pace with the Advancing Curriculum," *Research Bulletin of the National Education Association,* Vol. 3, Nos. 4 and 5. Washington: Research Division of the National Education Association, 1925, p. 107-92.

"Creating a Curriculum for Adolescent Youth," *Research Bulletin of the National Education Association,* Vol. 6, No. 1. Washington: Research Division of the National Education Association, 1928, p. 1-80.

but to mention Los Angeles,[73] Denver,[74] St. Louis,[75] Berkeley,[76] Winnetka,[77] and other cities to recall some of the big curriculum-revision projects that have been undertaken by school systems throughout the country. Many of these cities (notably Denver) have established bureaus of curriculum research to carry on continuous revision of the curriculum.

In addition to the many investigations and studies that are usually thought of in connection with curriculum research, several outstanding experiments have been conducted in experimental and laboratory schools, such as the University Elementary School at the University of Missouri, the Francis W. Parker School of Chicago, the Wisconsin High School at the University of Wisconsin, and the Horace Mann and Lincoln schools of Teachers College, Columbia University.[78] These schools can scarcely be said to make the study of curriculum problems their prime purpose, yet their distinctive features center largely around the curriculum. Furthermore, many such schools, by the very force of circumstances, make an empirical rather than a scientific approach to their curriculum problems. Consequently, we are not justified in applying the term "educational research" to many of their efforts. However, the number of such schools and their contributions to the solution of curriculum problems cannot be ignored in any complete account of curriculum research; they emphasize the prominence of such research during the past decade.

Finally, the inauguration of a Bureau of Curriculum Research at Teachers College, Columbia University, in 1924, is indicative of the

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[73]Bobbitt, Franklin. "Curriculum-Making in Los Angeles," *Supplementary Educational Monographs,* No. 20. Chicago: University of Chicago, 1922. 106 p. (Out of print.)
Bobbitt, Franklin. *How to Make a Curriculum.* Boston: Houghton, Mifflin Company, 1924. 292 p.

[74]Threlkeld, A. L. "Curriculum Revision: How a Particular City May Attack the Problem," *The Elementary School Journal,* 25: 573-82, April, 1925.
Newlon, J. H. and Threlkeld, A. L. "The Denver Curriculum-Revision Program," *Twenty-Sixth Yearbook of the National Society for the Study of Education,* Part I. Bloomington, Illinois: Public School Publishing Company, 1926, p. 229-40.
Newlon, J. H. "Curriculum Revision in Denver," *Journal of Educational Research,* 9: 262-63, March, 1924.

[75]Judd, C. H., *et al.* "Survey of the St. Louis Public Schools." Yonkers-on-Hudson, New York: World Book Company, 1918. 3 vols.

[76]Wilson, H. B. "The Course of Study in the Work of the Modern School," *Course of Study Monographs,* Introductory. Berkeley, California: Board of Education, 1921. 14 p.
Wilson, H. B. and Salisbury, E. I. "The Citizens' Relation to the Course of Study," *The Elementary School Journal,* 22: 677-85, May, 1922.

[77]Washburne, C. W. "A Grade-Placement Curriculum Investigation," *Journal of Educational Research,* 13: 284-92, April, 1926.
Washburne, C. W. "The Philosophy of the Winnetka Curriculum," *Twenty-Sixth Yearbook of the National Society for the Study of Education,* Part I. Bloomington, Illinois: Public School Publishing Company, 1926, p. 219-28.
Washburne, C. W., Vogel, Mabel, and Gray, W. S. "A Survey of the Winnetka Public Schools," *Supplementary Monograph, Journal of Educational Research.* Bloomington, Illinois: Public School Publishing Company, 1926. 135 p.

[78]The most comprehensive description of such schools is:
Dewey, John and Dewey, Evelyn. *Schools of Tomorrow.* New York: E. P. Dutton and Company, 1915. 316 p.

prominence that the curriculum has attained as a field of educational research. Three full-time research associates were appointed to this work and provided with a staff of clerical workers.[79]

Accomplishments of curriculum research. The most outstanding feature of curriculum research during the past ten-year period is the enormous amount of activity attested to by the number of reports of curriculum research, the number of courses of study that have been revised, and the amount of discussion of the subject in the educational press. In fact, the study and discussion of the curriculum has been almost an educational fad. However, this activity has produced some results that are substantial gains to education. In the first place, a large number of facts have been ascertained which are valuable additions to curriculum knowledge. Most curriculum studies have been made more or less independently and are fragmentary in nature; however, there have been several recent attempts to bring many related studies together, to evaluate them, and thus to help make the results more readily available. The summaries of reading and arithmetic investigations by Gray, and Buswell and Judd, and the yearbooks of the Department of Superintendence are examples of such attempts.

A few of the more outstanding research studies should be mentioned specifically in a résumé of accomplishments. Charters' *Curriculum Construction* was a pioneer study that brought together, summarized, and unified the activity-analysis studies that had been made prior to 1923. In all probability, Charters' influence has been greater than that of any other educator in making activity-analysis the most prominent technique of the period. Bobbitt's work, especially his Los Angeles curriculum venture, has been another monumental contribution of the period. Rugg and those associated with him, such as Hockett, have not only gathered much valuable information but have contributed much to the technique of curriculum research. Some of the large-scale revisions of city courses of study, such as those of Denver and St. Louis, have involved research on a large cooperative scale. Establishment of a bureau of curriculum research at Teachers College is an important step in the direction of recognizing the need for organized, systematic research in this field.

Although not involving research in any immediate way, Part II of the *Twenty-Sixth Yearbook of the National Society for the Study of Education*, "The Foundations of Curriculum Making," probably

[79]Stratemeyer, F. B. and Bruner, H. B. "Rating Elementary Courses of Study," *Studies of the Bureau of Curriculum Research of Teachers College, Columbia University Bulletin* No. 1. New York: Bureau of Publications, Teachers College, Columbia University, 1926, p. viii.

represents the most significant curriculum development of the period. As expressed in the Editor's Preface to the first volume, the idea back of the undertaking was to attack "the problem of the curriculum in a fundamental way—not trying to determine what the content of the curriculum should be, but trying to determine how that content should be selected and assembled." Perhaps, however, the most important contribution of this endeavor was the attempt "to bring together, and as far as possible to unify or to reconcile, the varying and often seemingly divergent or even antagonistic philosophies of the curriculum that were being espoused by leading authorities or by their adherents in this country." The curriculum development represented by this yearbook is very significant, for it has brought these diverse views together; and it is from such contacts that the larger view of the problems and methods of curriculum research issues.

The present trends. The Twenty-Sixth Yearbook provides us with some of the most tangible evidence of one of the three outstanding trends of curriculum research; that is, the trend away from implicit, unquestioning faith in purely objective methods toward a full recognition of the place of educational philosophy and a thoroughgoing evaluation of the data involved in all objective studies. A second outstanding trend is toward the launching of comprehensive, long-time studies, such as the work on the social-studies curriculum being conducted by Rugg at Teachers College in cooperation with many educators throughout the country. This may not mean any lessening of the number of isolated studies, although that is likely to result in time. The third trend is closely related to the second in that it involves continuous study of the curriculum over long periods of time. City bureaus of curriculum research are being established from time to time for the purpose of carrying on a systematic and regular evaluation and revision of the curriculum.

APPENDIX A

TABULAR SUMMARY OF ACTIVITIES OF THE BUREAU OF EDUCATIONAL RESEARCH AT THE UNIVERSITY OF ILLINOIS, 1918-27

Academic Year[a]	Letters written	Reports of Research, and other Scholarly Writings by Members of the Staff	Announcements, Lists of Tests, and Similar Writings	Material prepared by Persons not Members of the Staff	Total Pages of Published Writings
1918–19	3674	...	24	...	24
1919–20	7793	184	78	...	262
1920–21	7043	64	..	...	64
1921–22	2110	138	..	...	138
1922–23	2175	335	47	...	382
1923–24	2319	338	7	52	397
1924–25	2000[b]	356	41	171	568
1925–26	2493	407	..	186	593
1926–27	1766	274	43	75	392
1927–28	1600[b]	326	44	53	423
Total	32973	2422	284	537	3243

[a]The activities of the Bureau of Educational Research began July 8, 1918. The academic years, except the first, extend from July 1 to June 30. In computing the pages of reports, the dates borne by the several publications have been used.

[b]Estimated.

APPENDIX B

LIST OF PRINTED PUBLICATIONS OF THE BUREAU OF EDUCATIONAL RESEARCH AT THE UNIVERSITY OF ILLINOIS, JULY 8, 1918, TO JUNE 30, 1928

(Arranged in order of publication)

BUCKINGHAM, B. R. "Bureau of Educational Research Announcement, 1918-19," *University of Illinois Bulletin,* Vol. 16, No. 5, Bureau of Educational Research Bulletin No. 1. Urbana: University of Illinois, 1918. 24 p.

"First Annual Report, Announcement, 1919-20," *University of Illinois Bulletin,* Vol. 17, No. 9, Bureau of Educational Research Bulletin No. 2. Urbana: University of Illinois, 1919. 78 p. (Out of print.)

BAMESBERGER, V. C. "Standard Requirements for Memorizing Literary Material," *University of Illinois Bulletin,* Vol. 17, No. 26, Bureau of Educational Research Bulletin No. 3. Urbana: University of Illinois, 1920. 93 p. (Out of print.)

HOLLEY, C. E. "Mental Tests for School Use," *University of Illinois Bulletin,* Vol. 17, No. 28, Bureau of Educational Research Bulletin No. 4. Urbana: University of Illinois, 1920. 91 p. (Out of print.)

MONROE, W. S. "Report of Division of Educational Tests for 1919-20," *University of Illinois Bulletin,* Vol. 18, No. 21, Bureau of Educational Research Bulletin No. 5. Urbana: University of Illinois, 1921. 64 p.

MONROE, W. S. "The Illinois Examination," *University of Illinois Bulletin,* Vol. 19, No. 9, Bureau of Educational Research Bulletin No. 6. Urbana: University of Illinois, 1921. 70 p.

MONROE, W. S. "Types of Learning Required of Pupils in the Seventh and Eighth Grades and in the High School," *University of Illinois Bulletin,* Vol. 19, No. 15, Bureau of Educational Research Bulletin No. 7. Urbana: University of Illinois, 1921. 16 p.

MONROE, W. S. "A Critical Study of Certain Silent Reading Tests," *University of Illinois Bulletin,* Vol. 19, No. 22, Bureau of Educational Research Bulletin No. 8. Urbana: University of Illinois, 1922. 52 p.

Bureau of Educational Research. "Relation of Size of Class to School Efficiency," *University of Illinois Bulletin,* Vol. 19, No. 45, Bureau of Educational Research Bulletin No. 10. Urbana: University of Illinois, 1922. 39 p. (Out of print.)

MONROE, W. S. "Announcements of the Bureau of Educational Research for 1922-23," *University of Illinois Bulletin,* Vol. 20, No. 2, Bureau of Educational Research Circular No. 12.[1] Urbana: University of Illinois, 1922. 7 p. (Out of print.)

MONROE, W. S. "Definitions of the Terminology of Educational Measurements," *University of Illinois Bulletin,* Vol. 20, No. 6, Bureau of Educational Research Circular No. 13. Urbana: University of Illinois, 1922. 18 p.

MONROE, W. S. "Written Examinations and Their Improvement," *University of Illinois Bulletin,* Vol. 20, No. 7, Bureau of Educational Research Bulletin No. 9. Urbana: University of Illinois, 1922. 71 p. (Out of print. *See* No. 17.)

[1]The first eleven circulars, which are published in mimeographed form only, are not included in this list.

MONROE, W. S. "Relation of Sectioning a Class to the Effectiveness of Instruction,"*University of Illinois Bulletin,* Vol. 20, No. 11, Bureau of Educational Research Bulletin No. 11. Urbana: University of Illinois, 1922. 18 p. (Out of print.)

STREITZ, RUTH. "Gifted Children and Provisions for Them in Our Schools," *University of Illinois Bulletin,* Vol. 20, No. 13, Bureau of Educational Research Circular No. 14. Urbana: University of Illinois, 1922. 12 p. (Out of print.)

MONROE, W. S. "Educational Tests for Use in Elementary Schools," *University of Illinois Bulletin,* Vol. 20, No. 16, Bureau of Educational Research Circular No. 15. Urbana: University of Illinois, 1922. 22 p. (Out of print. *See* No. 49.)

ODELL, C. W. "The Use of Intelligence Tests as a Basis of School Organization and Instruction," *University of Illinois Bulletin,* Vol. 20, No. 17, Bureau of Educational Research Bulletin No. 12. Urbana: University of Illinois, 1922. 78 p. (Out of print.)

MONROE, W. S. and FOSTER, I. O. "The Status of the Social Sciences in the High Schools of the North Central Association," *University of Illinois Bulletin,* Vol. 20, No. 18, Bureau of Educational Research Bulletin No. 13. Urbana: University of Illinois, 1923. 38 p.

ODELL, C. W. "The Effect of Attendance Upon School Achievement," *University of Illinois Bulletin,* Vol. 20, No. 31, Bureau of Educational Research Circular No. 16. Urbana: University of Illinois, 1923. 8 p. (Out of print.)

MONROE, W. S. and CARTER, R. E. "The Use of Different Types of Thought Questions in Secondary Schools and Their Relative Difficulty for Students,"*University of Illinois Bulletin,* Vol. 20, No. 34, Bureau of Educational Research Bulletin No. 14. Urbana: University of Illinois, 1923. 26 p.

MOHLMAN, D. K. "The Elementary School Principalship," *University of Illinois Bulletin,* Vol. 20, No. 36, Bureau of Educational Research Circular No. 17. Urbana: University of Illinois, 1923. 14 p. (Out of print.)

MONROE, W. S. "Educational Tests for Use in High Schools," *University of Illinois Bulletin,* Vol. 20, No. 38, Bureau of Educational Research Circular No. 18. Urbana: University of Illinois, 1923. 18 p. (Out of print. *See* No. 48.)

STREITZ, RUTH. "Provisions for Exceptional Children in 191 Illinois Cities," *University of Illinois Bulletin,* Vol. 20, No. 40, Bureau of Educational Research Circular No. 19. Urbana: University of Illinois, 1923. 13 p.

*MCCLUSKY, F. D. "Place of Moving Pictures in Visual Education," *University of Illinois Bulletin,* Vol. 20, No. 46, Bureau of Educational Research Circular No. 20. Urbana: University of Illinois, 1923. 11 p. (Out of print.)

MONROE, W. S. "Announcement of the Bureau of Educational Research for 1923-24," *University of Illinois Bulletin,* Vol. 21, No. 3, Bureau of Educational Research Circular No. 21. Urbana: University of Illinois, 1923. 7 p. (Out of print.)

ODELL, C. W. "Provisions for the Individual Differences of High School Pupils," *University of Illinois Bulletin,* Vol. 21, No. 4, Bureau of Educational Research Circular No. 22. Urbana: University of Illinois, 1923. 15 p.

*The asterisk indicates that the author is not a member of the staff of the Bureau of Educational Research.

MONROE, W. S. "The Constant and Variable Errors of Educational Measurements," *University of Illinois Bulletin,* Vol. 21, No. 10, Bureau of Educational Research Bulletin No. 15. Urbana: University of Illinois, 1923. 30 p.

ODELL, C. W. "An Annotated Bibliography Dealing with the Classification and Instruction of Pupils to Provide for Individual Differences," *University of Illinois Bulletin,* Vol. 21, No. 12, Bureau of Educational Research Bulletin No. 16. Urbana: University of Illinois, 1923. 50 p.

MONROE, W. S. and SOUDERS, L. B. "The Present Status of Written Examinations and Suggestions for Their Improvement," *University of Illinois Bulletin,* Vol. 21, No. 13, Bureau of Educational Research Bulletin No. 17. Urbana: University of Illinois, 1923. 77 p.

MONROE, W. S. "Educational Guidance in High Schools," *University of Illinois Bulletin,* Vol. 21, No. 15, Bureau of Educational Research Circular No. 23. Urbana: University of Illinois, 1923. 14 p.

*NOLAN, A. W. "The Project in Education with Special Reference to Teaching Agriculture," *University of Illinois Bulletin,* Vol. 21, No. 16, Bureau of Educational Research Circular No. 24. Urbana: University of Illinois, 1923. 16 p.

MONROE, W. S. and CLARK, J. A. "Measuring Teaching Efficiency," *University of Illinois Bulletin,* Vol. 21, No. 22, Bureau of Educational Research Circular No. 25. Urbana: University of Illinois, 1924. 26 p.

*BARTON, H. J., CLARK, E. L., PENCE, HELEN, and others. "Notes on the Teaching of Latin in High Schools," *University of Illinois Bulletin,* Vol. 21, No. 28, Bureau of Educational Research Circular No. 26. Urbana: University of Illinois, 1924. 25 p. (Out of print.)

STREITZ, RUTH. "Teachers' Difficulties in Arithmetic and Their Correctives," *University of Illinois Bulletin,* Vol. 21, No. 34, Bureau of Educational Research Bulletin No. 18. Urbana: University of Illinois, 1924. 34 p.

ODELL, C. W. "The Progress and Elimination of School Children in Illinois," *University of Illinois Bulletin,* Vol. 21, No. 38, Bureau of Educational Research Bulletin No. 19. Urbana: University of Illinois, 1924. 76 p.

STREITZ, RUTH. "Educational Diagnosis," *University of Illinois Bulletin,* Vol. 21, No. 41, Bureau of Educational Research Circular No. 27. Urbana: University of Illinois, 1924. 16 p.

*STALEY, S. C. "The Program of Sportsmanship Education," *University of Illinois Bulletin,* Vol. 21, No. 49, Bureau of Educational Research Circular No. 28. Urbana: University of Illinois, 1924. 27 p. (Out of print.)

MONROE, W. S. and MOHLMAN, D. K. "Training in the Technique of Study," *University of Illinois Bulletin,* Vol. 22, No. 2, Bureau of Educational Research Bulletin, No. 20. Urbana: University of Illinois, 1924. 66 p. (Out of print.)

MONROE, W. S. (Director). "A Survey of the City Schools of Marion, Illinois," *University of Illinois Bulletin,* Vol. 22, No. 3, Bureau of Educational Research Bulletin No. 21. Urbana: University of Illinois, 1924. 60 p.

ODELL, C. W. "The Use of the Question in Classroom Instruction," *University of Illinois Bulletin,* Vol. 22, No. 5, Bureau of Educational Research Circular No. 29. Urbana: University of Illinois, 1924. 18 p. (Out of print.)

ODELL, C. W. "The Evaluation and Improvement of School Buildings, Grounds and Equipment," *University of Illinois Bulletin,* Vol. 22, No. 6, Bureau of Educational Research Circular No. 30. Urbana: University of Illinois, 1924. 18 p.

MONROE, W. S. "The Planning of Teaching," *University of Illinois Bulletin,* Vol. 22, No. 7, Bureau of Educational Research Circular No. 31. Urbana: University of Illinois, 1924. 41 p.

*MILLER, F. J., FLICKINGER, R. C., SARGENT, R. L., LUKE, E. J., THOMPSON, G. D., and others. "Latin in High Schools," *University of Illinois Bulletin,* Vol. 22, No. 12, Bureau of Educational Research Circular No. 32. Urbana: University of Illinois, 1924. 28 p.

ODELL, C. W. "Educational Tests for Use in Elementary Schools, Revised," *University of Illinois Bulletin,* Vol. 22, No. 16, Bureau of Educational Research Circular No. 33. Urbana: University of Illinois, 1924. 22 p.

ODELL, C. W. "Conservation of Intelligence in Illinois High Schools," *University of Illinois Bulletin,* Vol. 22, No. 25, Bureau of Educational Research Bulletin No. 22. Urbana: University of Illinois, 1925. 55 p.

STREITZ, RUTH. "Teachers' Difficulties in Reading and Their Correctives," *University of Illinois Bulletin,* Vol. 22, No. 30, Bureau of Educational Research Bulletin No. 23. Urbana: University of Illinois, 1925. 35 p.

*SEYBOLT, R. F. "The Evening School in Colonial America," *University of Illinois Bulletin,* Vol. 22, No. 31, Bureau of Educational Research Bulletin No. 24. Urbana: University of Illinois, 1925. 68 p.

ODELL, C. W. "Educational Tests for Use in High Schools, Revised," *University of Illinois Bulletin,* Vol. 22, No. 37, Bureau of Educational Research Circular No. 34. Urbana: University of Illinois, 1925. 19 p.

MONROE, W. S. and JOHNSTON, N. B. "Reporting Educational Research," *University of Illinois Bulletin,* Vol. 22, No. 38, Bureau of Educational Research Bulletin No. 25. Urbana: University of Illinois, 1925. 63 p. (Out of print.)

*BROWNELL, W. A. "A Study of Supervised Study," *University of Illinois Bulletin,* Vol. 22, No. 41, Bureau of Educational Research Bulletin No. 26. Urbana: University of Illinois, 1925. 48 p. (Out of print.)

MONROE, W. S. "Making a Course of Study," *University of Illinois Bulletin,* Vol. 23, No. 2, Bureau of Educational Research Circular No. 35. Urbana: University of Illinois, 1925. 35 p. (Out of print.)

*GLICK, H. N. "Effect of Practice on Intelligence Tests," *University of Illinois Bulletin,* Vol. 23, No. 3, Bureau of Educational Research Bulletin No. 27. Urbana: University of Illinois, 1925. 23 p. (Out of print.)

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*ALTER, D. R., DUGUID, GENEVIEVE, KUKETS, W. R., MCHARRY, L. J., TAYLOR, S. H., and THOMSEN, ANNE. "Instructional Activities in The University High School," *University of Illinois Bulletin,* Vol. 24, No. 13, Bureau of Educational Research Circular No. 47. Urbana: University of Illinois, 1926. 28 p.

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MONROE, W. S. and ENGELHART, M. D. "The Techniques of Educational Research," *University of Illinois Bulletin,* Vol. 25, No. 19, Bureau of Educational Research Bulletin No. 38. Urbana: University of Illinois, 1928. 84 p.

*MONROE, W. S., HINDMAN, D. A., and LUNDIN, R. S. "Two Illustrations of Curriculum Construction," *University of Illinois Bulletin,* Vol. 25, No. 26, Bureau of Educational Research Bulletin No. 39. Urbana: University of Illinois, 1928. 53 p.

ODELL, C. W. "A Glossary of Three Hundred Terms Used in Educational Measurement and Research," *University of Illinois Bulletin,* Vol. 25, No. 28, Bureau of Educational Research Bulletin No. 40. Urbana: University of Illinois, 1928. 68 p.

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TEN YEARS OF EDUCATIONAL RESEARCH, 1918-1927

PART II

CHAPTER I
INTRODUCTION

Scope of list of reports of educational research and related materials. The following list is intended to include all "worth-while" reports of educational research and related materials which have been published in this country during the past ten years—that is, from January, 1918, to the time of going to press—except articles in periodicals and certain other more or less regular publications, such as the routine reports of city superintendents, state departments of education, and the *Biennial Survey* of the United States Bureau of Education. Also, there have been included materials published in English outside of the United States in so far as they deal with education in this country. Furthermore, books that originally appeared prior to 1918 but which have been revised since that date are included if so doing is justified on other grounds.

The adjective "worth-while" is used to describe writings that have a distinct value or interest to research workers in the field of education. All doctors' theses in education have been listed whether they have appeared in printed form or not and even though in some cases they seem scarcely to deserve the name of research. Masters' theses, however, have not been included unless they have been published and have appeared to merit inclusion.

The criterion used to determine whether texts and other books should be included was that they contain accounts of research not available, or at least not readily available, elsewhere. The mere fact that a book quotes or refers to a considerable amount of educational research was not considered a sufficient reason to justify its being listed, but so long as it contains something of this nature not found elsewhere it was not required that a volume be devoted entirely or largely to reporting research. If it seemed doubtful whether or not a book should be included, it was ordinarily given the benefit of the doubt and its title placed in the list. A few books, chiefly those dealing with educational statistics, have been included because they treat of the procedures and techniques of research, even though they cannot be said in all cases to be either reports or results of research. Text books and other treatises dealing with statistics from the purely mathematical standpoint or from any other than that of education have not been included. Standardized tests and other measuring instruments have not themselves been listed. Test manuals and booklets of directions have been included if they contain accounts of deriva-

tion or of critical studies, or are the original, most important, or most readily available reports of norms.

Most descriptions of education in foreign countries which contain a more or less general account of a whole system have been included, even though they cannot be said to be reports of research. Likewise, publications giving the history of various colleges and other institutions of higher learning have been listed, as well as the biographies or autobiographies of prominent educators. A number of the references given have been considered worthy of inclusion because of the fact that they contain rather extensive bibliographies. Indeed, a few of them are mere bibliographies and nothing else.

Several types of writings have been omitted. Materials of primarily local interest, such as surveys or reports of test scores or other data for a single city or county system, or in some cases for a small group of systems, have been omitted unless distinguished by some special feature which indicates that they are not of a routine character and hence would be of value to persons at work elsewhere. Among such special features are unusual analyses of test results, collections of comparative data not available, or at least not readily available, elsewhere in the same form, and the use of research procedures not commonly employed in similar situations. Although the regular reports of state departments of education have not been included, state surveys, reports of scores from the state-wide use of tests, and other more or less similar material derived from studies covering whole states, or even fairly large portions thereof, have been included as possessing more or less general interest. Mere descriptions of procedures or special features of a school system, even though they are decidedly unusual, have not been included. Reports of psychological research which appear to have no direct connection with education have been omitted. Some writings that might be classified as educational research have been omitted on the general ground that they are too unimportant to be worth giving. Many of these are very brief, perhaps only a portion of a page, and frequently are summarized or quoted from a much more complete study that has been included.

It was found impossible to secure and examine all writings of which the title was known. In the case of books, an effort was made to find reviews which might give helpful information. In most cases, however, it was necessary to base the decision as to whether to include the publication merely upon the title, perhaps aided by a general knowledge of the kind of writing usually done by the author. It is probable that a small number of references have been included which

do not belong in the list and perhaps a few "worth-while" ones have been excluded.

Method of compiling list. Persons using this list of reports of educational research and related writings will doubtless ask concerning its completeness. Needless to say, absolute completeness is impossible, as is likewise a definite statement of how nearly that desirable goal has been attained. An effort was made, however, to make the list just as complete as possible without an unreasonable expenditure of time and money to secure additional references. Some idea of how nearly it approaches completeness may be gained from the following list of the chief sources which were consulted in its preparation.

1. All material filed or indexed at the Bureau of Educational Research, University of Illinois.
2. All material shelved or cataloged at the Education Seminar of the University of Illinois.
3. All material classified under education, psychology, and other related headings in the general library of the University of Illinois.
4. Material in the professional libraries of several members of the faculty of the College of Education, University of Illinois.
5. The United States Bureau of Education record of current educational publications.
6. Lists of publications received by the following periodicals:
   - A. *Journal of Educational Research*
   - B. *Journal of Educational Psychology*
   - C. *Elementary School Journal*
   - D. *School Review*
   - E. *Educational Administration and Supervision*
   - F. *Journal of Applied Psychology*
7. All bibliographies in publications of the Bureau of Educational Research and those listed in the "Bibliography of Bibliographies."
8. All known educational series such as yearbooks, monographs, research bulletins, and so forth.

In addition, a circular request for information concerning publications issued since January 1, 1918, which might be classified under the head of reports of educational research, was addressed to all State Departments of Education, State Teachers' Associations, and to foundations and other educational associations. In compiling the list of foundations and other educational associations, the 1926 *Handbook of Educational Associations and Foundations in the United States*, issued by the United States Bureau of Education, was used as a source of information. A similar letter of inquiry was addressed to a number

of colleges of education and educational publishers. The response to these two circular inquiries was very gratifying. Examination of the replies indicated that information had been contributed by practically all of those addressed who probably had published reports of educational research during the period under consideration. Only one educational institution known to publish monographs and bulletins declined to supply the information desired.

In compiling the titles of doctors' theses in Education, preliminary lists for all institutions conferring this degree were prepared from the records in the Bureau of Educational Research.[1] These preliminary lists were mailed to the several institutions for correction. Corrected lists were received from all institutions. Hence, it is believed that the list of titles of doctors' theses in education for the period 1918-27 is complete and accurate. Doctors' theses for this period are indicated in the following pages by an asterisk (*). The date is that of the calendar year during which the degree was actually conferred. Information in regard to the publication of the thesis has been included whenever it was known. In case the thesis has been published in a form not known to be identical with the original, the reference is given after the word *See*. A few titles for degrees to be conferred during the calendar year of 1928 have been included, but no effort has been made to secure such titles. A number of titles of theses for degrees conferred prior to January 1, 1918, have been published since this date. These, of course, have been included, but no attempt has been made to identify them.

The form of bibliographical references. Since the list of titles is a very lengthy one, it seemed desirable to shorten the form of bibliographical references as much as possible and yet give the essential information. The shortening has been accomplished by omitting superfluous information and by using abbreviations. The names of well-known publishers have been changed by using a single word for the complete name. For example, The Macmillan Company is given as "Macmillan," and Charles Scribners' Sons as "Scribners." In the case of the publications of the United States Bureau of Education and other departments of the Federal Government, the "Superintendent of Public Documents, Government Printing Office" has been omitted because it is generally understood that this office should be addressed when ordering government publications. The name of an educational institution or of a Bureau of Educational Research has been omitted

[1]The Bureau of Educational Research has issued compilations of the titles of masters' and doctors' theses since 1917.

when preceding information in the reference clearly indicates the institution or Bureau to be addressed in ordering a copy of the publication. In giving information concerning the titles of doctors' theses in education, the name of the institution conferring the degree has been shortened, usually to a single word. For example, "Illinois" has been used in the place of University of Illinois, and "Peabody" in the place of George Peabody College for Teachers. In general, initials have been used for given names unless there was only one. Other abbreviations have been used for various words and phrases. The following list is given for reference.

ABBREVIATIONS[2]

Acad., Academy
Acct., Accounts, Accounting
Adm., Administration
Adv., Advancement
Ag., Agriculture, Agricultural
Amer., America, American
An., Annual
Assn., Association

Bd., Board
Bk., Book
Bul., Bulletin
Bur., Bureau

Cath., Catholic
Cath. U., Catholic University of America
Cir., Circular
Col., College
Com., Commission, Committee
Comp., Comparative
Con., Council
Conf., Conference
Cont., Contribution
Ct., City
Cur., Curriculum

Dept., Department
Dist., District
Div., Division
Doc., Document

Ed., Education, Educational
El., Elementary
Eng., English

E. R., Educational Research
Exp., Experiment, Experimental
Ext., Extension

Fed., Federal
Fnd., Foundation

Gen., General
Govt., Government, Governmental
Grad., Graduate

Hist., Historical
Hlth., Health
H. S., High School

I., Illinois
Inst., Institute, Institution
Instr., Instruction
Internatl., International

J. E. R., Journal of Educational Research
Jour., Journal

Lf., Leaflet
Lib., Library

Math., Mathematics, Mathematical
Meas., Measurement
Med., Medicine
Mono., Monograph
Mtg., Meeting

N. A. S., National Academy of Science
Natl., National

[2]It was not considered necessary to include in this list well-known abbreviations, such as those for names of states.

In some cases, an abbreviation stands for one of two or more forms of the same word; for instance, "Stat." stands for "Statistics" or "Statistical," and "Tch." for "Teacher," "Teachers," or "Teaching." The context will enable the reader to determine the form of the word for which the abbreviation stands.

N. C. A., North Central Association
N. E. A., National Education Association
N. S. C. T. E., National Society of College Teachers of Education
N. S. S. E., National Society for the Study of Education

Off., Office, Official

p., page
Phys., Physical
Pr., Press
Prin., Principal
Proc., Proceedings
Psy., Psychology, Psychological
pt., part
Ptg., Printing
Pub., Public, Publishing, Publications

Qr., Quarterly

Ref., Reference
Reorg., Reorganization
Res., Research
Rpt., Report
R. S. F., Russell Sage Foundation
Rv., Review

Sc., Science
Sch., School
Sec., Secondary
ser., series
Soc., Society, Social
St., State
Stat., Statistics, Statistical
Stud., Study, Studies
S. U. I., State University of Iowa
Supp., Supplement, Supplementary
Supt., Superintendent, Superintendence
Sur., Survey

T. C., Teachers College, Columbia University
T. C. C., Teachers College Contribution
Tch., Teacher, Teaching
Tr., Training
Trans., Transactions

U., University

v., volume
Vent., Ventilation

Wk., Week
Wlf., Welfare

Yrbk., Yearbook

CHAPTER II

REPORTS OF EDUCATIONAL RESEARCH AND RELATED MATERIALS, 1918-1927

1. Abbott, Allan, *et al. Composition Standards.* New York: Bur. of Pub., T. C., 1927. 66 p.
2. Abbott, J. W. "Kindergartens Past and Present," *Bur. of Ed. Kindergarten Cir.*, no. 11. Washington. 5 p.
3. Abel, J. F. "State Aid to Weak Schools," *Bur. of Ed. Rural Sch. Lf.*, no. 7. Washington, 1922. 12 p.
4. Abel, J. F. "An Annotated List of Official Publications on Consolidation of Schools and Transportation of Pupils," *Bur. of Ed. Rural Sch. Lf.*, no. 9. Washington, 1923. 12 p.
5. Abel, J. F. "Consolidation of Schools and Transportation of Pupils," *Bur. of Ed. Bul.*, 1923, no. 41. Washington, 1923. 135 p.
6. Abel, J. F. "Training Courses in Consolidation of Schools and Transportation of Pupils," *Bur. of Ed. Rural Sch. Lf.*, no. 23. Washington, 1924. 6 p.
7. Abel, J. F. "Recent Data on Consolidation of Schools and Transportation of Pupils," *Bur. of Ed. Bul.*, 1925, no. 22. Washington, 1925. 24 p.
8. Abel, J. F. "A Study of 260 School Consolidations," *Bur. of Ed. Bul.*, 1924, No. 32. Washington, 1925. 39 p.
9. Abel, T. M. "Tested Mentality as Related to Success in Skilled Trade Training," *Archives of Psy.*, no. 77. New York: Columbia University, 1925. 82 p.
10. *Abelson, H. H. The Improvement of Intelligence Testing. Teachers College, 1927. *T. C. C.* no. 273. New York: Bur. of Pub., 1927. 71 p.
11. Achilles, E. M. "Experimental Studies in Recall and Recognition," *Archives of Psy.*, no. 44. New York: Columbia University, 1920. 80 p.
12. Ackerson, Luton. "A Correlational Study of Proficiency in Typing," *S. U. I. Mono. in Ed.*, ser. 1, no. 7. Iowa City, 1926, p. 88-95.
13. *Adams, C. L. A Study of Variability and Grade Progress. Peabody, 1927.

Adams, E. S. *See* 869.

14. Adams, E. W. "A Study of Continuation School Pupils," *10th An. Schoolmen's Wk. Proc.* Philadelphia: U. of Pa., 1923, p. 189-200.
15. Adams, F. J. The Present Status of Certain Beliefs Related to Public School Vocational Guidance Programs and Activities. California, 1928. To be pub. by Div. of Voc. Ed., U. of Calif.
16. *Adams, J. E. Curricula for Small High Schools. Indiana, 1925. *See*: "Determinants of Curricula for Small High Schools," *Proc. H. S. Prin. Conf.* Bloomington, 1925, p. 30-44.

Adams, W. R. *See* 797.

17. Adamson, J. W. *A Short History of Education.* Cambridge: Harvard U. Pr., 1919. 371 p.
18. Adee, J. N. "The Use of Educational Measurements in Formulating Changes in the Course of Study," *5th An. Schoolmen's Wk. Proc.* Philadelphia: U. of Pa., 1918, p. 111-14.
19. *Agnew, W. D The Administration of Professional Schools for Teachers. Teachers College, 1924. Baltimore: Warwick and York, 1924. 262 p.
20. Akagi, R. H. "The Educational System in Japan," *Japanese Students' Christian Assn. in N. A. Pamphlets*, ser. 1, no. 2. New York, 1926. 48 p.

21. ALBERTY, H. B. "Vocational Interests of High-School Pupils as a Factor in High-School Education," *3rd An. O. St. Ed. Conf. Proc.* Columbus: O. St. U., 1923, p. 285-98.

22.*ALBERTY, H. B. A Study of the Project Method in Education. Ohio State, 1926. *O. St. U. Stud.*, no. 2. Columbus, 1927. 111 p.

23.*ALDERMAN, G. H. The Lecture Versus the Question-and-Answer Method of Class Instruction. Iowa, 1920.

24. ALDERMAN, G. H. "The Effect of Certain Kinds of Drill Exercises on Comprehension," *10th Conf. on Ed. Meas.* Bloomington: Ind. U., 1923, p. 12-25.

25. ALDERMAN, G. H. "Improving Comprehension Ability in Silent Reading," *Bul. of the Sch. of Ed.*, v. 1, no. 3. Bloomington: Ind. U., 1925, p. 28-37.

26. ALDERMAN, L. R. "Public Evening Schools for Adults," *Bur. of Ed. Bul.*, 1927, no. 21. Washington, 1927. 22 p.

27. ALEXANDER, CARTER. *School Statistics and Publicity.* New York: Silver, Burdett, 1919. 332 p.

28. ALEXANDER, CARTER. "The County Training Schools of Wisconsin," *7th An. Schoolmen's Wk. Proc.* Philadelphia: U. of Pa., 1920, p. 93-98.

29. ALEXANDER, CARTER. "Bibliography on Educational Finance," *Rpt. of the Ed. Finance Inquiry Com.*, v. 4. New York: Macmillan, 1924. 257 p.

30. ALEXANDER, CARTER. "A Transplanted American Educational Administration: The Philippine School System," *15th Yrbk. N. S. C. T. E.* Chicago: U. Pr., 1926, p. 128-45.

31. ALEXANDER, CARTER and THEISEN, W. W. *Publicity Campaigns for Better School Support,* Yonkers, N. Y.: World, 1921. 164 p.

32. ALEXANDER, CARTER, *et al. Educational Research.* New York: Bur. of Pub., T. C., 1927. 47 p.

ALEXANDER, CARTER. *See* 943.

33.*ALEXANDER, THOMAS. The Prussian Elementary Schools. Teachers College, 1918. New York: Macmillan, 1918. 571 p.

ALEXANDER, THOMAS. *See* 1241, 1568.

34.*ALLEN, C. B. Factors Contributing to the Growth in Public High School Enrollment. California, 1927.

35. ALLEN, C. F. and ROEMER, JOSEPH. *Extra-Curricular Activities in Junior and Senior High Schools.* Boston: Heath, 1926. 333 p.

ALLEN, C. R. *See* 2396.

36. ALLEN, F. J. *A Guide to the Study of Occupations.* Cambridge: Harvard U. Pr., 1921. 183 p.

37.*ALLEN, R. D. The New Function of Educational and Vocational Guidance:—A Scientific Selective Agent in Public Educational Administration. Brown, 1921.

37a.ALLEN, W. O. "Methods of Admission to College," *13th An. Schoolmen's Wk. Proc.* Philadelphia: U. of Pa., 1926, p. 163-67.

38.*ALLEN, W. S. A Study in Latin Prognosis. Teachers College, 1923. *T. C. C.*, no. 135. New York: Bur. of Pub., 1923. 41 p.

39.*ALLTUCKER, M. M. The Case Method in Education. California, 1922.

40. ALLTUCKER, M. M. "What are the Aims and Objectives in Education?" *2nd Yrbk., Dept. of Supt.* Washington: N. E. A., 1924, p. 81-96.

41. ALLTUCKER, M. M. "What are some of the Present Methods of Determining Curricula?" *2nd Yrbk., Dept of Supt.* Washington: N. E. A., 1924, p. 98-104.

42*ALMACK, J. C. The Adaption of the School Building to a Program of Educational Efficiency. Stanford, 1923.

43. ALMACK, J. C. *The School Board Member.* New York: Macmillan, 1927. 281 p.
44.*ALTHAUS, C. B. The Distribution of the Tax Burden of Township and Community High Schools in Illinois. Chicago, 1927. Chicago: Ill. Ag. Assn., 1927. 98 p.
45.*AMES, W. R. Intelligence of High School Seniors in Montana. Wisconsin, 1926.
46.*ANDERSEN, W. N. The Determination of a Spelling Vocabulary Based upon Written Correspondence. Iowa, 1918. *S. U. I. Stud. in Ed.,* v. 2, no. 1. Iowa City, 1921. 66 p.
47. ANDERSON, C. J. "The Status of Teachers in Wisconsin." Madison, Wis.: Dept. of Pub. Instr., 1923. 156 p.
48. ANDERSON, C. J., *et al. Visiting the Teacher at Work; Case Studies of Directed Teaching.* New York: Appleton, 1925. 382 p.
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49.*ANDERSON, E. J. Factors Determining Success in Teaching English to Chinese Students. Chicago, 1924. *See: English Teaching Efficiency in China.* Shanghai: Commercial Press, 1925. 182 p.
50.*ANDERSON, E. W. The Teacher's Contract and Other Legal Phases of Teacher Status. Teachers College, 1927. *T. C. C.,* no. 246. New York: Bur. of Pub., 1927. 180 p.
51. ANDERSON, E. W. and KEELER, LEWIS. "A Critical Analysis of the Kansas School Readers," *U. of Kan. Bul. of Ed.,* v. 1, no. 3. Lawrence, 1927, p. 5-9.
52.*ANDERSON, H. W. A Method for Determining the Housing Requirements for Junior High School Programs. Iowa, 1925. *S. U. I. Stud. in Ed.,* v. 3, no. 3. Iowa City, 1926. 56 p.
ANDERSON, H. W. *See* 2258.
53. ANDERSON, L. D. "The Relationships of Certain Environmental Factors to Measures of Mechanical Ability," *27th Yrbk., N. S. S. E.,* pt. 2. Bloomington, Ill.: Pub. Sch. Pub. Co., 1928, p. 137-50.
54. ANDERSON, L. F. *History of Manual and Industrial School Education.* New York: Appleton, 1926. 251 p.
55.*ANDERSON, M. L. Experimental Study of Intelligence Tests. New York, 1922.
56.*ANDERSON, R. G. A Critical Examination of Test-Scoring Methods. Columbia, 1925.
ANDERSON, R. G. *See* 1678.
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57.*ANDRESS, J. M. Herder as an Educator. Clark, 1919. New York: Stechert.
58. ANDREWS, B. F. "The Land Grant of 1862 and the Land Grant Colleges," *Bur. of Ed. Bul.,* 1918, no. 13. Washington, 1918. 63 p.
59.*ANDREWS, W. H. A Study of the Educational Legislation and the Administration of the Public School System of Kansas., Chicago, 1923.
60.*ANDRUS, RUTH. A Tentative Inventory of the Habits of Children from Two to Four Years of Age. Teachers College, 1924. *T. C. C.,* no. 160. New York: Bur. of Pub., 1924.
61. ANNUSSON, JURI. "Public Instruction in Estonia," *Bur. of Ed. Bul., Foreign Ed. Lf.,* no. 2 Washington, 1926. 24 p.
62.*ANTONIA, SISTER M. The Preparation of the Religious Teacher—A Foundational Study. Cath. U., 1926.
63.*ARCHDEACON, J. P. The Week-Day Religious School. Cath. U., 1927.
64.*ARCHER, C. P. Transfer of Training in Spelling. Iowa, 1927.

65. ARCHIBALD, R. C. "The Training of Teachers of Mathematics," *Reorg. of Math. in Sec. Ed.* Math. Assn. of Amer., 1923, p. 429-508. (Obtainable from J. W. Young, Dartmouth College, Hanover, N. H.)

66.*ARENT, EMMA. The Relation of the State to Private Education in Norway: A Study of the Historical Development of State Regulations Governing the Various Types of Private Education in Norway. Teachers College, 1927. *T. C. C.,* no. 235. New York: Bur. of Pub., 1927. 94 p.

ARMENTROUT, C. B. *See* 1073.

67.*ARMENTROUT, W. D. The Conduct of Student Teaching in State Teachers' Colleges. Harvard, 1926. *Colo. Tch. Col. Ed. Ser.,* no. 2. Greeley, 1927. 198 p.

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CHAPTER III

TOPICAL INDEX TO THE REPORTS OF EDUCATIONAL RESEARCH AND RELATED MATERIALS

Formulation of topics. In preparing the topics to be used in the Index, a preliminary list was taken with some modifications from a topical outline which has been employed since 1922 by the Bureau of Educational Research for the classification of educational writings, including those in bound volumes, periodicals, reports, and bulletins. This outline consists of twenty-five main headings or divisions each of which is subdivided. The subdivisions of the main headings range in number from only a few up to more than forty topics. As the reports of educational research and related writings were examined, some topics were modified and quite a number of others were added, usually by way of additional subdivision. If it appeared desirable to do so, those topics upon which a considerable number of references were found were subdivided and new topics formed. In a few cases, two or even more closely related topics were combined into one. For example, two of the original topics were "Physical Education" and "Administration of Physical Education," but when it was found that there were practically no references dealing with research in the latter, it was combined with the former under the title of "Physical Education." By the procedures just described a list of approximately six hundred and fifty topics was prepared.

Arrangement of topics. In alphabetizing the topics, the arrangement has been based upon what seemed to be the most important or outstanding word in each topic. In order to save space, the words "school" and "education" have been omitted wherever it seemed that such an omission would not impair the meaning. For example, instead of such topics as "Education in Canada" and "School Accounting," the shorter forms "Canada" and "Accounting" have been employed. Moreover, since all the references are restricted to the field of education, it is to be understood that every topic given refers to some phase of education. Hence, such topics as "Libraries" and "Finance" refer to "School Libraries" and "School Finance" respectively.

Cross-references. In addition to the almost six hundred and fifty topics actually employed, about two hundred cross-references are given. A large number of these deal with topics about which there might be some doubt as to the word to come first, and therefore as to where to look in the Index. Thus, "Administration in Small Cities"

appears with a reference to the topic "Small Cities, Administration in." Similarly, "Intelligence of Negroes" is followed by a cross-reference to "Negroes, Intelligence of." Other cross-references are given in the case of more or less synonymous terms or topics. If one looks up "Bonding" he is referred to "Indebtedness," and if he looks up "Games" he is referred to "Athletics." It has not seemed necessary to give many cross-references for topics actually followed by lists of references to others of the same sort, for at least two reasons. In the first place, many references have been listed after two or more topics and thus may be found by looking up one of the topics without the necessity of consulting any other. For instance, a certain reference which has the title "Deficiency and Delinquency and the Interpretation of Mental Testing" has been classified under the following three topics: "Delinquents," "Subnormal Children," and "Intelligence Tests." In the second place, the more general and inclusive topics are commonly followed only by the numbers of those references which are also general. For example, the only references included under the topic "Foreign Education" are those which deal with foreign education in general or in a considerable number of countries, not with that in any one country or even in a limited number of countries. To give a second example, the topic "Achievement Tests" includes only those references which deal with such tests in general or with tests in a large number of different subjects, not with those particularly devoted to tests in one or a few subjects.

Classification of references. In the effort to make the classification of references as uniform as possible, it was done entirely by one person. An actual examination was made of all writings available except those with which the classifier was already familiar. In the paragraphs stating what references were included in this list,[1] mention was made of the fact that a number were included without being directly examined. Naturally these had to be classified without examination, and it is probable that in a number of cases erroneous classifications were made or possible additional ones omitted. Many of the references, probably most of them, were classified under only one topic, but a large number were placed under two or three and some under even more. However, there was no intention of making the classification exhaustive. For example, not every reference which includes the use of intelligence tests has been listed, but only those that in the judgment of the classifier possess distinct value for anyone interested in that topic. Moreover, books and some other references

[1] *See* p. 147 f.

dealing with a rather large number of more or less closely related topics were ordinarily classified under a single general topic rather than under each of several subordinate ones. For example, Gilliland and Jordan's *Educational Measurements and the Classroom Teacher,* a book dealing with various types of tests and also with related topics, was not classified under each topic dealt with, but merely under the general heading "Achievement Tests." However, if such a book in addition to its general contents contained a rather outstanding or lengthy contribution on some one or two topics, it was also classified under these.

How to use the Topical Index. As will be seen by glancing at the Index, the topics included are followed by numbers. These are the serial numbers of the references. Anyone seeking references upon a certain topic should, therefore, find this topic in the Index, note the numbers that follow it, and look up the references having these numbers in the preceding list. Even though rather detailed topics have been employed, and a considerable number of cross-references given, the Index does not contain every possible topic. It will, therefore, sometimes be necessary for anyone seeking information on a certain topic to think of all possible wordings or ways of stating the topic and to look for these in order to find the one desired. Furthermore, search should be made for as detailed a topic as possible; that is, one who is seeking references upon any specific phase of school finances rather than upon school finances in general, should look for the particular topic in which he is interested, such as "Accounting," "Indebtedness," "State Aid," and so forth, rather than for the general topic of "Finance."

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CHAPTER IV

LIST OF DOCTORS OF PHILOSOPHY IN EDUCATION BY INSTITUTIONS, 1918-27

The titles of the theses submitted in partial fulfilment of the requirements for the doctor's degree in education may be found in the alphabetical list of reports of educational research and related materials beginning on page 153.

In the following list of doctors of philosophy in education, the arabic numerals in parentheses after the names of the institutions give the number of degrees conferred during the period 1918-27 inclusive. For a tabulation by years, see Table I, page 47.

Boston College (1)

Kennedy, W. H. J., 1925

Boston University (5)

Cheverton, C. F., 1918
Fiske, D. G. W., 1919
Hawkes, F. P., 1927
Kao, F. S., 1923
Linehan, W. F., 1927

Brown University (8)

Allen, R. D., 1921
Bird, G. E., 1918
Crosby, P. R., 1926
Dealey, H. L., 1918
Flint, E. M., 1922
Liao, S. C., 1921
MacPhail, A. H., 1923
Wood, H. D., 1925

Bryn Mawr College (1)

Neterer, I. M., 1923

University of California (42)

*Adams, F. J., 1928
Allen, C. B., 1927
Alltucker, M. M., 1922
Bennett, G. V., 1926
Bennion, A. S., 1924
Berry, R. E., 1924
*Bush, R. H., 1928
Cairns, L., 1926
Cole, E. L., 1926
Cowles, L. E., 1927
*Day, J. F., 1928
Eby, H. L., 1923
Fosdick, A. M., 1922
French, R. S., 1920
Groves, J. W., 1923
Hamilton, A. J., 1927
Horn, J. L., 1923
Horridge, F., 1925
Hughes, W. H., 1927
Hull, O. R., 1926
Hunter, F. M., 1925
Kyte, G. C., 1922
*Lewis, M. S., 1928
Massey, H. N., 1922
Nanninga, S. P., 1926
Nyswander, D. B., 1926
Patty, W. W., 1926
Peterson, L. H., 1923

*Degree conferred in 1928.

Rector, W. G., 1923
Rowell, P. E., 1922
Rutledge, R. E., 1926
Stone, W. H., 1924
Tenney, E. V., 1927
Valentine, P. F., 1927
Walker, J. F., 1924
Washburne, C. W., 1922
Westcott, R. H., 1923
Wiley, R. B., 1927
Wilkinson, W. J., 1927
Woodward, H. M., 1921
Worlton, J. T., 1926
Yates, D. M. H., 1921

CARNEGIE INSTITUTE OF TECHNOLOGY (1)

Moore, B. V., 1920

CATHOLIC UNIVERSITY OF AMERICA (28)

Antonia, Sister M., 1926
Archdeacon, J. P., 1927
Callixta, Sister M., 1926
Cassidy, P. F., 1924
Cote, A. B., 1927
Cronin, J. T., 1927
Daly, W. A., 1924
Foran, T. G., 1926
Hamill, J. E., 1922
Hubbell, L. G., 1924
Jeanette, Sister M., 1918
Johnson, George, 1919
Keaveny, Leo, 1922
Kopf-Seitz, Carola, 1926
Kuntz, L. F., 1927
Larkin, T. E., 1918
McLean, D. A., 1923
McDonald, L. P., 1927
Mahoney, R. H., 1922
Mary Alma, Sister, 1921
Mary Louis, Sister, 1924
Mary Louise, Sister, 1920
Paschang, J. L., 1927
Pia, Sister M., 1924
Rooney, J. R., 1926
Schuetz, John, 1918
Solnitzky, Othmar, 1920
Thibeau, P. W., 1922

UNIVERSITY OF CHICAGO (59)

Althaus, C. B., 1927
Anderson, E. J., 1924
Andrews, W. H., 1923
Bennett, H. E., 1925
Blauch, L. E., 1923
Bossing, N. L., 1925
Breslich, E. R., 1926
Brooks, T. D., 1921
Brownell, W. A., 1926
Burruss, J. A., 1921
Burton, W. H., 1924
Buswell, G. T., 1920
Carter, T. M., 1923
Cavins, L. V., 1924
Crawford, C. C., 1924
Edmondson, J. B., 1925
Gilliland, A. R., 1922
Good, C. V., 1925
Guiler, W. S., 1923
Harrington, F. B., 1921
Henry, N. B., 1923
Hogan, R. M., 1927
Holzinger, K. J., 1922
Johnson, R. I., 1923
Johnson, W. H., 1923
Lazerte, M. E., 1927
Lehman, H. C., 1925
Loh, S. L., 1922
McClusky, F. D., 1922
McElhannon, J. C., 1926
McCucken, W. J., 1927
Nutt, H. W., 1923
Otomo, S., 1924
Pendleton, C. S., 1921
Rainey, H. P., 1924
Reavis, W. C., 1925
Reeder, W. G., 1921
Reeves, F. W., 1925
Reinoehl, C. M., 1920
Richardson, W. L., 1919
Russell, C. P., 1923
Scates, D. E., 1926
Schutte, T. H., 1923
Smith, L. W., 1919
Stormzand, M. J., 1920
Stout, J. E., 1918
Tanner, V. L., 1922
Terry, P. W., 1920

Thompson, C. H., 1925
Tingelstad, O. A., 1925
Tubbs, E. V., 1924
Tyler, R. W., 1927
Uhl, W. L., 1921
Vaughn, J., 1927
Wager, R. E., 1922
Weathersby, W. H., 1919
West, P. V., 1922
Willett, G. W., 1923
Wood, E. R., 1923

UNIVERSITY OF CINCINNATI (5)

Hendrickson, G., 1927
Lindsley, C. B., 1926
Mary Carmel, Sister, 1925
Yeuell, G. H., 1927
Zeiders, C. E., 1925

CLARK UNIVERSITY (7)

Andress, J. M., 1919
Coe, G. A., 1922
Freeland, G. E., 1920
Richmond, Winifred, 1919
Ridgley, D. C., 1925
Rikimaru, J., 1923
Sprowls, J. W., 1919

CORNELL UNIVERSITY (12)

Baldwin, R. D., 1926
Bayne, T. L., 1926
Blanton, A. W., 1927
Fugh, P. C., 1924
Kehr, M. W., 1920
Lathrop, F. W., 1922
Nelson, M. G., 1926
Reaman, G. E., 1920
*Sexauer, T. E., 1928
Steere, H. J., 1927
Wakeman, S., 1922
Woodward, C. R., 1926

UNIVERSITY OF DENVER (1)

Shuck, M. E., 1919

GEORGE PEABODY COLLEGE FOR TEACHERS (51)

Adams, C. L., 1927
Atkinson, W. R., 1927
Barnett, Albert, 1926
Bourne, W. R., 1923
Boynton, P. L., 1927
Collier, C. B., 1926
Collins, E. A., 1926
Crabb, A. L., 1925
Cuff, N. B., 1927
Dawson, H. A., 1926
Donovan, H. L., 1925
Falls, J. D., 1926
Garris, E. W., 1926
Garrison, K. C., 1927
Garrison, S. C., 1919
Golightly, T. J., 1926
Graham, J. L., 1927
Grant, J. R., 1925
Grise, F. C., 1924
Hedrick, C. E., 1927
Hillman, J. E., 1924
Ivy, H. M., 1922
Jarrett, R. J., 1927
Judd, C. D., 1919
Leiper, M. A., 1926
Lowrey, R. G., 1927
McClure, C. H., 1926
Mallory, J. N., 1922
Manchester, Paul, 1927
Meadows, J. C., 1927
Meadows, T. B., 1923
Mitchell, M. R., 1926
Napier, T. H., 1926
Parkinson, B. L., 1926
Patrick, Wellington, 1926
Phelps, Shelton, 1919
ReBarker, Herbert, 1926
Robertson, M. S., 1925
Robinson, J. R., 1927
Roemer, Joseph, 1919

Shankle, G. E., 1926
Sharp, L. A., 1919
Sherrod, C. C., 1924
Shreve, Francis, 1921
Sisk, T. K., 1925
Smith, N. A., 1924
Storm, A. V., 1919
Terrell, R. F., 1926
Weaver, C. P., 1922
Webb, H. A., 1920
Zeigel, W. H., 1924

GEORGE WASHINGTON UNIVERSITY (11)

Barrows, H. P., 1919
Garber, J. A., 1920
Greenleaf, W. J., 1922
John, W. C., 1918
Muerman, J. C., 1922
O'Rourke, L. J., 1922
Phillips, F. M., 1919
Ryan, W. C., 1918
Salisbury, E. G., 1920
Sargent, H. O., 1926
Shinn, E. H., 1923

HARVARD UNIVERSITY (77)

Armentrout, W. D., 1926
Beatley, B., 1923
Benner, T. E., 1923
Berry, E., 1925
Blake, M. B., 1925
Bridge, S. H., 1923
Burlingame, F. M., 1926
Carmichael, L., 1924
Cattell, P., 1927
Chapman, A. D. E., 1922
Ch'u, Shih-Ying, 1926
Churchill, E. A., 1924
Combs, M. L., 1927
Cummings, L. O., 1921
Davis, D. G., 1927
Davis, G. P., 1926
Dewey, G., 1926
Dexter, W. F., 1921
Doermann, H. J., 1925
Dudley, L. L., 1927
Elwell, A. F., 1925
Estabrooks, G. H., 1926
Fick, M. L., 1924
Flinner, I. A., 1926
Freeman, F. S., 1926
Fronabarger, B. F., 1926
Galt, H. S., 1927
Gerry, H. L., 1923
Glueck, E. T., 1925
Gove, F. S., 1924
Hall, S. B., 1926
Hershey, C. B., 1923
Hodges, W. T., 1925
Hodgkinson, L. M., 1922
Holl, R. C., 1921
Hopkins, L. T., 1922
Humphrey, George, 1920
Jacobs, R. L., 1926
Jaqua, E. J., 1919
Kelly, R. W., 1919
Kreager, F. O., 1925
Lancaster, C. F., 1923
Latshaw, H. F., 1925
Lincoln, E. A., 1924
Livingood, F. G., 1925
McCracken, T. C., 1918
Macdonald, N. C., 1921
Manahan, J. L., 1918
Marvin, C. H., 1919
Mathiasen, O. F., 1927
Maverick, L. A., 1925
Meier, W. H. D., 1919
Michell, E., 1926
Mosher, E. R., 1923
Murphy, W. M., 1923
Noble, M. C. S., 1924
Partch, C. E., 1926
Payne, A. F., 1923
Prescott, D. A., 1923
Price, R. R., 1923
Purdom, J. L., 1918
Reed, C. A., 1921
Rice, G. A., 1925
Robinson, G. C., 1918
Shaw, E. A., 1918
Small, C. R., 1925
Smith, C. W., 1927
Spaulding, F. T., 1926
Stephens, S. D., 1927
Stoke, S. M., 1926
Tuller, A. L., 1920
Walter, R. W., 1926

Weill, B., 1927
Wentworth, M. M., 1924
Westbrook, C. H., 1920
Works, G. A., 1925
Wright, F. L., 1925

UNIVERSITY OF ILLINOIS (13)

Broyles, W. A., 1925
Capps, A. G., 1921
Dolch, E. W., 1925
Glick, H. N., 1924
Greene, J. H., 1920
Knudsen, C. W., 1927
McKinney, H. T., 1921
Nolan, A. W., 1924
O'Brien, J. A., 1920
Odell, C. W., 1922
Reinhardt, Emma, 1927
Stevenson, J. A., 1918
Weber, O. F., 1926

INDIANA UNIVERSITY (7)

Adams, J. E., 1925
Halnon, W., 1925
McIntosh, D. C., 1924
Marshall, H. W., 1927
Mull, L. B., 1926
Shannon, J. R., 1927
Wyckoff, R. T., 1927

STATE UNIVERSITY OF IOWA (69)

Alderman, G. H., 1920
Andersen, W. N., 1918
Anderson, H. W., 1925
Archer, C. P., 1927
Ashbaugh, E. J., 1919
Bane, C. L., 1924
Bassett, B. B., 1918
Bathurst, J. E., 1926
Benz, H. E., 1927
Bishop, Omen, 1924
Blackstone, E. G., 1926
Brueckner, L. J., 1919
Burgess, T. O., 1926
Camp, H. L., 1921
Carmichael, A. M., 1927
Charles, J. W., 1926
Cordts, A. D., 1925
Cushman, C. L., 1927
DeGraff, M. H., 1925
Del Manzo, M. C., 1924
Franzen, C. G. F., 1920
Freden, Gustaf, 1927
*Fritz, R. A., 1928
Germane, C. E., 1920
Goetch, E. W., 1925
Gordon, W. E., 1926
Greene, H. A., 1919
Gregory, C. A., 1920
Gribble, S. C., 1925
Hansen, E. A., 1925
Hayes, M. C., 1927
Hilliard, G. H., 1922
Hines, H. C., 1920
Holy, T. C., 1924
Huffaker, C. L., 1923
Inman, J. H., 1927
James, H. W., 1923
Jorgensen, A. N., 1927
Lemon, A. C., 1926
Lessenger, W. E., 1925
Lindquist, E. F., 1927
Lindsay, E. E., 1922
Luse, E. M., 1925
Lutes, O. S., 1926
McCoy, J. P., 1924
McDowell, F. M., 1918
McKee, P. G., 1924
Madsen, I. N., 1923
Martin, H. F., 1918
Masters, H. V., 1927
Meyer, J. W., 1918
Noyer, R. W., 1922
Peterson, E. T., 1927
Pollock, R. L., 1926
Ritter, E. L., 1920
Roberts, L. F., 1927
Rogers, D. C., 1923
Russell, R. D., 1923
Searle, A. H., 1927
Slater, C. P., 1927
Tai, Tse-Chien, 1925
Tallman, R. W., 1925
Taylor, W. H., 1925
Tireman, L. S., 1927

Tu, Horace Tsou Chow, 1924
Vander Beke, G. E., 1926
White, Wendell, 1926
Woods, R. C., 1927
Yoakam, G. A., 1922

JOHNS HOPKINS UNIVERSITY (7)

*Broening, A. M., 1928
*Dougherty, M. L., 1928
Franklin, E. E., 1924
Hoke, E. R., 1922
Hoke, R. E., 1922
Nagle, J. S., 1926
Snyder, Agnes, 1927

UNIVERSITY OF KANSAS (2)

Bermajo, F. V., 1923
Hoover, J. H., 1920

LELAND STANFORD JUNIOR UNIVERSITY (31)

Almack, J. C., 1923
Balyeat, F. A., 1927
Benjamin, H. R. W., 1927
Burch, M. C., 1927
Cady, V. M., 1926
Darsie, M. L., 1924
Dickson, V. E., 1919
Douglass, H. R., 1927
Eells, W. C., 1927
Jensen, M. B., 1927
*Kibby, I. W., 1928
Kohs, S. C., 1919
Lang, A. R., 1924
MacQuarrie, T. W., 1924
Merriam, Curtis, 1922
Merrill, A. N., 1926
Mirrielees, L. B., 1924
Otis, A. S., 1920
Proctor, W. M., 1919
Root, W. T., 1920
Ruch, G. M., 1922
Salisbury, F. S., 1924
Sias, A. B., 1926
Staffelbach, E. H., 1926
Stockton, J. L., 1920
*Taylor, H. R., 1928
Thomas, F. W., 1926
Tupper, C. R., 1927
Wyman, J. B., 1924
Young, Kimball, 1921
Zyve, D. L., 1926

UNIVERSITY OF MICHIGAN (14)

Baker, H. J., 1920
Brown, A. W., 1924
Courtis, S. A., 1925
Ellis, M. M., 1926
Harris, W. L., 1925
Josselyn, H. W., 1921
Moehlman, A. B., 1923
Purdom, T. L., 1925
Rankin, P. T., 1926
Sangren, P. V., 1925
Schmidt, A. G., 1923
Searles, C. K., 1923
Shriner, W. O., 1926
Spain, C. L., 1923

UNIVERSITY OF MINNESOTA (21)

Bohan, J. E., 1926
Carreon, M. L., 1923
Dickinson, Sherman, 1926
Distad, H. W., 1926
Dvorak, August, 1923
Hughes, J. M., 1924
Hutson, P. W., 1925
Johnson, O. J., 1921
Johnson, W. E., 1919
Jordan, R. H., 1919
Olson, W. C., 1926
Powers, J. O., 1925
Powers, S. R., 1923
Reeve, W. D., 1924
Saupe, W. J., 1924
Smith, H. J., 1926
Tiegs, E. W., 1927
Troxel, O. L., 1926
Von Borgersrode, F. R., 1927
Weersing, F. J., 1927
Whitney, F. L., 1922

UNIVERSITY OF MISSOURI (7)

Crouch, R. A., 1926
Diefendorf, J. W., 1926
Foster, H. L., 1926
Montague, J. F., 1926
Schott, E. L., 1925
Taft, Linwood, 1918
Watkins, R. K., 1923

NEW YORK UNIVERSITY (80)

Anderson, M. L., 1922
Aspinall, Richard, 1926
Barrow, H. R., 1926
Bay, J. C., 1927
Benson, N. P., 1919
Best, E. M., 1920
Blashfield, H. W., 1927
Bliss, J. G., 1926
Bradshaw, O. S., 1926
Bruning, W. C., 1922
Bullova, Alma, 1923
Chou, Wo Min, 1920
Corson, D. B., 1924
Creager, J. O., 1925
Crow, Lester, 1927
Davis, R. L., 1923
Drushel, J. A., 1927
Eapen, C. T., 1925
Edmund, Gertrude, 1919
*Evans, E. B., 1928
Eyters, Ebenezer, 1918
Forcheimer, Estelle, 1919
Gardner, E. A., 1923
Gast, I. M., 1925
Geiss, M. H. M., 1919
Gill, C. M., 1927
Gills, M. B., 1927
Gjesdahl, F. L., 1922
Goldman, Henry, 1918
Goldrich, L. W., 1918
Grover, E. C., 1925
Halbert, A. E., 1925
Henig, M. S., 1925
Hsiao, T. E., 1924
Hu, Chang-Ho Jiugow, 1918
Hunter, G. W., 1918
Jahrling, Robert, 1922
Kaplan, Gordonson, 1927
Keith, H. H., 1918
Keller, Fred, 1919
Kramer, E. L., 1927
Lee, A. S., 1925
Levine, A. J., 1921
*Li, Shu Tang, 1928
Lomax, P. S., 1927
Lu, Pao-Ching, 1927
McDonald, M. I., 1923
Manalac, G. R., 1918
Maruyama, Kazuteru, 1920
Maynard, J. A., 1919
Mendenhall, R. E., 1925
Meyer, J. G., 1926
Newlon, H. T., 1927
Nobis, Georgia, 1926
Noonan, J. F., 1926
Palmland, Rebecca, 1918
Paul, F. H. J., 1924
Pennock, G. L., 1919
Picard, Maurice, 1919
Pickett, R. E., 1924
Pullman, W. S., 1919
Rabus, Maximilian, 1926
Rich, S. G., 1923
Rider, L. A., 1926
Roberts, J. S., 1918
Roberts, R. S., 1924
Seto, Yau S., 1927
Silberstein, Nathan, 1920
Skinner, C. E., 1923
Skinner, H. C., 1927
Smits, M. N., 1926
Stitt, E. W., 1924
Strumpf, B. E., 1926
*Takayama, Keyoshi, 1928
Taylor, J. S., 1924
Van Bauer, Alice, 1924
Wagner, T. J., 1922
Wills, E. V., 1923
Yin, Chiling, 1923
Zimmerman, Oscar, 1920

OHIO STATE UNIVERSITY (35)

Alberty, H. B., 1926
Bruce, W. F., 1926
Chambers, O. R., 1926
Chapman, H. B., 1926
Cohen, I. L., 1927
Conners, F. H., 1927

Eckelberry, R. H., 1927
Ekdahl, A. G., 1925
Ekdahl, N. M. G., 1925
Erffmeyer, C. E., 1925
Farnsworth, P. R., 1925
Ferguson, J., 1927
Gatewood, E. L., 1919
Heck, A. O., 1924
Heer, A. L., 1926
Hullfish, H. G., 1924
Kiefer, F., 1927
Koch, H. C., 1926
Landsittel, F. C., 1926
Martz, V., 1927
Morton, R. L., 1925
Orata, P. T., 1927
Pratt, K. C., 1927
Reamer, J. C., 1920
Renshaw, S., 1925
Rickey, E., 1924
Saleste, P. H., 1925
Scholtz, T. L., 1926
Schrammel, H. E., 1925
South, E. B., 1927
Stevenson, D. H., 1926
Stewart, A. W., 1927
Thompson, L. A., 1927
Williamson, F. J., 1925
Worcester, D. A., 1926

UNIVERSITY OF OREGON (1)

Baker, R. E., 1927

UNIVERSITY OF PENNSYLVANIA (28)

Bardy, J., 1923
Boyer, P. A., 1920
Brooks, J. D., 1925
Cole, R. D., 1927
Davis, S. B., 1921
Doughton, I., 1925
Evans, Florence, 1926
Ferguson, A. W., 1924
Garver, F. M., 1920
Grizzell, E. D., 1922
Groves, W. A., 1925
Hamblen, A. A., 1923
Haskell, R. I., 1924
Hauser, C. A., 1922
Hawkes, E. J., 1927
Hutchinson, R. C., 1925
King, L. A., 1920
Klain, Z., 1924
Kramer, F. H., 1920
Lowery, M. L., 1924
Lyons, F. W., 1925
Maria, Sister J., 1925
Minnich, J. H., 1918
Rohrbach, Q. A. W., 1925
Ross, Carmon, 1922
Shaw, R. T., 1926
Waples, Douglas, 1920
Ziegler, S. H., 1923

UNIVERSITY OF PITTSBURGH (5)

Champlain, C. D., 1925
Guy, J. F., 1923
Hollinger, J. D., 1926
Maxwell, P. A., 1927
Sones, W. W. D., 1925

UNIVERSITY OF SOUTH CAROLINA (1)

Crum, M., 1925

UNIVERSITY OF SOUTHERN CALIFORNIA (1)

Lefever, D. W., 1927

SYRACUSE UNIVERSITY (3)

Chou, Fu Chuan, 1921
Hung, M. E., 1922
Moi, Chin Yeu, 1918

TEACHERS COLLEGE, COLUMBIA UNIVERSITY (306)

Abelson, H. H., 1927
Agnew, W. D., 1924
Alexander, Thomas, 1918
Allen, W. S., 1923
Anderson, E. W., 1927
Andrus, Ruth, 1924
Arent, Emma, 1927
Aucamp, A. J., 1926
Avent, J. E., 1925
Ayer, A. M., 1926
Bailor, E. M., 1925
Bamberger, F. E., 1922
Barringer, B. E., 1925
Bartlett, L. W., 1926
Belting, P. E., 1919
Bender, J. F., 1927
Benedict, M. J., 1927
Bennett, H. G., 1926
Benson, C. E., 1922
Bere, May, 1924
Berkson, I. B., 1919
Blankenship, A. S., 1926
Boehmke, M. J. W., 1919
Borgeson, F. C., 1927
Brace, D. K., 1927
Brim, O. G., 1920
Brinkley, S. G., 1925
Brooks, F. D., 1921
Brown, A. W., 1926
*Brubacher, J. S., 1928
Bruner, H. B., 1925
Buckner, C. A., 1918
Burdge, H. G., 1922
Burgess, M. A., 1920
Burgess, W. R., 1920
*Burns, R. L., 1928
Butterweck, J. S., 1927
Carpenter, W. W., 1926
Carr, J. W., 1927
Carroll, R. P., 1927
Carrothers, G. E., 1924
Case, A. T., 1924
Chang, Peng C., 1924
Chassell, C. F., 1920
*Chassell, J. O., 1928
Childs, H. G., 1918
Chou, H. H. C., 1923
Chu, Jennings Pinkwei, 1922
Chuang, Chai Hsuan, 1922
Clark, H. F., 1924
Clark, J. R., 1925
Clem, O. M., 1924
Collings, P. E., 1924
Cook, J. H., 1925
Cooper, H. E., 1924
Coryell, N. G., 1927
Cox, P. W. L., 1925
Coy, G. L., 1923
Crabbs, L. M., 1925
Craig, G. S., 1927
Crane, A. G., 1920
Cross, E. A., 1926
Crow, C. S., 1924
Cummins, R. A., 1918
Cunningham, B. V., 1923
Cunningham, K. S., 1927
Curoe, P. R. V., 1926
Curtis, F. D., 1924
Daily, B. W., 1926
Davis, M. D., 1925
Day, M. S., 1926
Dearborn, N. H., 1925
Demiashkevich, M. J., 1926
Denworth, K. M., 1927
Douglass, B. C., 1924
Dunn, F. W., 1920
Dushkin, A. M., 1918
Dyer, W. P., 1927
Edgerton, A. H., 1926
Eickenberry, D. H., 1926
Elliott, R., 1927
Emmons, F. E., 1926
Engelhardt, Fred, 1925
Engelhardt, N. L., 1918
Ensign, F. C., 1921
Evenden, E. S., 1919
Finley, C. W., 1926
Flanders, J. K., 1926
Flemming, C. W., 1926
Ford, W. S., 1927
Forest, I. G., 1927
Fowlkes, J. G., 1924
Franzen, R. H., 1923
Frasier, G. W., 1922
Fretwell, E. K., 1919
Frost, Norman, 1921
Gambrill, B. L., 1922
Gamoran, Emanuel, 1924
Ganders, H. S., 1926
*Garrison, N. L., 1928
Gifford, W. J., 1918
Granrud, J., 1927
Graves, K. B., 1924
Grossman, M., 1926
Hall, E. L., 1923
Hall-Quest, A. L., 1925

Hamilton, F. R., 1925
Hamilton, O. T., 1927
Hansen, A. O., 1926
Hanson, W. L., 1925
Harap, Henry, 1924
*Harper, M. H., 1928
Hart, F. W., 1920
Helseth, I. O., 1926
Henzlik, F. E., 1924
Herring, J. P., 1924
Hertzberg, O. E., 1926
Hertzog, W. S., 1921
Higbie, E. C., 1921
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